SERVICE MANUAL

MODEL 42-01
TRANSMISSION TEST SET

HEKIMIAN LABORATORIES, INC.
15825 SHADY GROVE ROAD
ROCKVILLE, MARYLAND 20850 USA

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SECTION 1.0
INTRODUCTION

1.1 GENERAL DESCRIPTION

The Model 42-01 Transmission Test Set combines the functions of noise, level, and frequency measurement with a flexible signal generator in a compact, portable instrument designed to fill a variety of requirements. It features a high level of reliability, accuracy, and operating convenience.

Dual digital displays simultaneously present fully autoranged noise/level measurements and frequency readings from 40 Hz to 20 kHz. Indicating pushbutton switches are arranged for ease of operation, and all variable controls have excellent resolution and setability. Independent selection of receive and send impedances and an audio monitor add to the unit's flexibility.

Level measurements are made directly in dBm using an average type detector in compliance with Bell System Standards. Noise measurements are made directly in dBrn using a quasi-rms detector. Program, C-Message, 3 kHz flat, and 15 kHz flat weighting filters are front-panel selected and meet the revised (1975) Bell System Standards.

A second display provides a fast update, fully autoranging 4-digit frequency readout in kHz with a 1 Hz or 10 Hz resolution.

The flexible signal generator features both continuous and 100.4 Hz step frequency coverage. For noise measurement, both a low distortion crystal-controlled 1004 Hz holding tone and a quiet termination are provided. In addition, the unit features two fixed frequencies and one fixed level. To achieve high resolution and setability, the frequency and level controls are true 10-turn instrument potentiometers.

An audio monitor is provided to monitor the signal being measured.

The Model 42 is a rugged, compact instrument powered by a self-contained power supply which draws 15 W from the commercial ac power line. The test set is optionally available with an internal rechargeable battery supply. The power cord and fuse are located inside the rear-panel storage compartment.

1.2 SPECIFICATIONS

The electrical and mechanical specifications for the Model 42 are listed in Table 1-1. A photograph of the Model 42-01 is shown in Figure 1-1.

TABLE 1-1
SPECIFICATIONS

GENERAL	
Measurements	Level (dBm), Noise (dBrn), Noise-to-Ground (dBrn), Frequency (kHz)
Displays	Dual display, noise or level, and frequency
Generator	Sine wave, fixed and variable frequency, fixed and variable level
Dial/Talk	Full 2-Wire/4-Wire capability with electronic 2-Wire hold circuit.
Line Select	Input-Output transfer switch

INPUT

Impedance	600 Ω, 900 Ω bridged (balanced)
Return Loss	>30 dB, 200 Hz to 20 kHz
Balance	>60 dB, up to 4 kHz
Line Hold	Electronic 2-Wire hold, nominal 26 mA

LINE MEASUREMENT

Frequency Range	40 Hz to 20 kHz
Measurement Range	-80.0 dBm to +10.0 dBm, full autoranging.
Accuracy	dBm

	40 Hz	100 Hz	4 kHz	20 kHz
+10	±0.5	±0.2 dB*	±0.5	
-40	±1.0	±1.0 dB	±1.0	
-70				

*±0.1 dB at 1000 Hz for levels between 0 and -19 dBm

Detector Type	Average

NOISE MEASUREMENT

Modes	Noise (Message Circuit) Noise-to-Ground
Weighting Filters	C-Message 3 kHz Flat Program 15 kHz Flat Holding-tone notch on all filters (995 to 1025 Hz)
Measurement Range	+10 to +100 dBrn (noise) +40 to +130 dBrn (noise-to-ground) Full autoranging
Accuracy	±1.0 dB (noise), ±20 to ±100 dBrn ±1.5 dB (noise-to-ground), +50 to +130 dBrn
Detector Type	Quasi-rms

FREQUENCY MEASUREMENT

Frequency Range	40 Hz to 20 kHz, full autoranging Usable to over 50 kHz at reduced sensitivity
Level Range	-40 dBm to +10 dBm
Resolution/Update	0.040 to 9.999 kHz/7 times per second 10.00 to 20.00 kHz/7 times per second
Accuracy	±1 count

GENERATOR

Frequency Range	200 Hz to 20 kHz Continuous 100.4 Hz, locked 402 Hz, fixed 1004 Hz, fixed 2811 Hz, fixed OFF (Quiet Termination)

Level Range	-40 dBm to +10 dBm, continuously adjustable
	-13 dBm, fixed (set at 1004 Hz)
Distortion	>60 dB, 1004 Hz fixed
	>50 dB, 200 Hz to 4000 Hz
	>40 dB, 4000 Hz to 20 kHz
Impedance	600 Ω, 900 Ω (balanced)
Return Loss	>30 dB, 200 Hz to 20 kHz
CONNECTORS	310 type jack
POWER	105-130, 210-260 V ac, 47-63 Hz, 15 W
MECHANICAL	9-1/2" (24.13 cm) W x 5" (12.7 cm) H x 15" (38.1 cm) D with cover
WEIGHT	11 lbs (5 kg) with cover less battery pack
	14.5 lbs (6.6 kg) with cover and battery pack

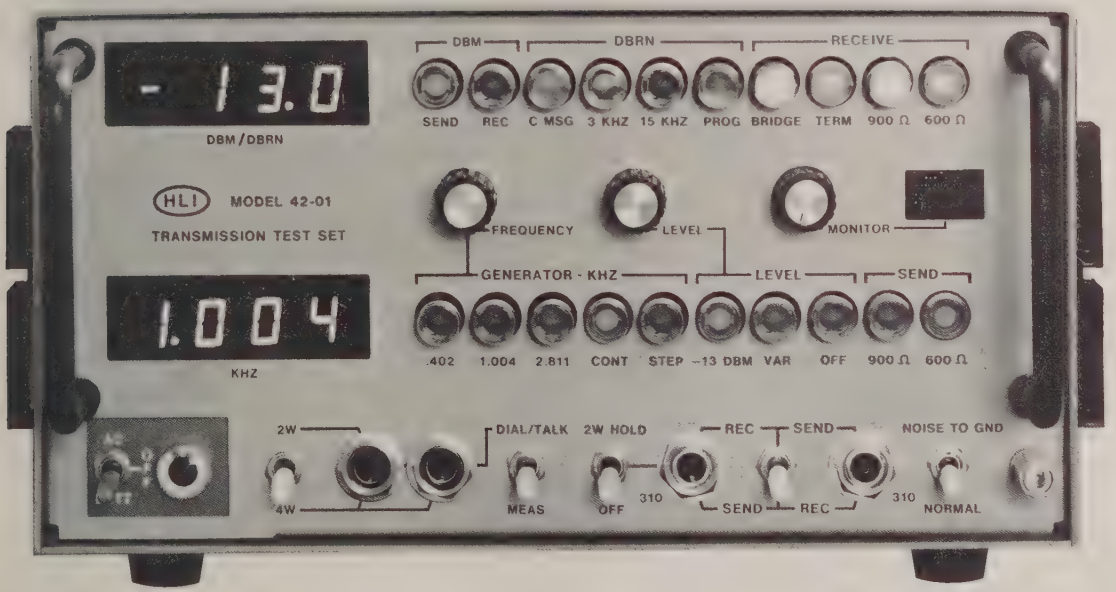

FIGURE 1-1. MODEL 42-01 TRANSMISSION TEST SET

SECTION 2.0
INSTALLATION

2.1 GENERAL

The Model 42-01 Transmission Test Set is designed for ease of operation and installation. After the unit has been removed from its shipping container, perform a complete visual inspection for possible damage. If damage is found, notify the carrier immediately; do not destroy any packing material until an agent of the carrier has examined it. Under U.S. shipping regulations, damage claims must be submitted by the consignee. Do not return the instrument to Hekimian Laboratories, Inc., until a claim for damages has been established.

All internal adjustments have been set at the factory and no further adjustments are required prior to installation or use of the equipment.

2.2 INSTALLATION

Power for the unit is supplied either from the ac power line via the line cord or from internal rechargeable batteries. The batteries will be charged as long as the unit is connected to the ac power line. Access to the ac line cord and main fuse is made by removal of the storage compartment cover on the rear of the unit. This compartment is provided for storage of the ac line cord and other small adapters or test cables that may be used with the test set. The lid may be attached to the unit with the ac line cord either in or out.

Signal receive/send lines are connected to the front-panel Western Electric 310 jacks. Shielded cable is recommended for all signal connections.

2.3 SUB-ASSEMBLY REPLACEMENT

This section contains the removal instructions for the Model 42 printed circuit board and batteries (optional).

2.3.1 MAIN PRINTED CIRCUIT BOARDS

There are two pairs of printed circuit boards. The first pair contains the receive circuitry and digital volmeter. The second pair contains the clock circuitry, frequency counter, and generator.

NOTE

To maintain proper calibration, these boards must always be replaced in pairs.

To remove the printed circuit board pairs, remove the two front-panel attachment screws on each side of the test set as shown in Figure 2-1. Lift the front panel straight out and then to the right. The board pairs may then be removed by gripping the switch brackets and gently pulling forward.

To replace the board pairs, line the switch board up with the highest or lowest card guide and gently push the board pair into the unit until fully seated in the rear-panel connector. Line up the front panel

and position it over the switch pushbuttons. Replace the four mounting screws.

2.3.2 POWER SUPPLY ASSEMBLY

The power supply and batteries (optional) make up a separate subassembly mounted on the bottom plate of the test set. To remove the power supply assembly, remove the power supply mounting screws shown in Figure 2-1 from each side of the unit.

Separate the power supply assembly and mainframe by gently lifting the mainframe up and to the front of the power supply assembly. Remove the flat cable connector which feeds the mainframe from the power supply. The power supply assembly can then be repaired or replaced.

To reassemble the unit, connect the flat cable connector to the power supply and reassemble the mainframe and power supply assemblies.

2.3.3 BATTERIES (OPTIONAL)

As an option, the unit is powered by two 12 V rechargeable batteries. These batteries have been selected for minimum maintenance and long life.

If it becomes necessary to replace the batteries or the fuses for the battery charging circuitry, remove the power supply assembly as described in Section 2.3.2. Once the power supply assembly is separated from the mainframe, remove the two screws on each side of the battery tray. Remove the batteries by lifting them up and out of the battery holder. Care should be taken to ensure that the battery leads are not reversed. The violet wire goes to the negative terminal of one battery while the red wire goes to the positive terminal of the other battery. The white/black wires go to the one remaining terminal of each battery on each side of the unit. The fuses for the battery charging circuitry are located on the power supply board and can be easily replaced once the power supply assembly has been separated from the mainframe.

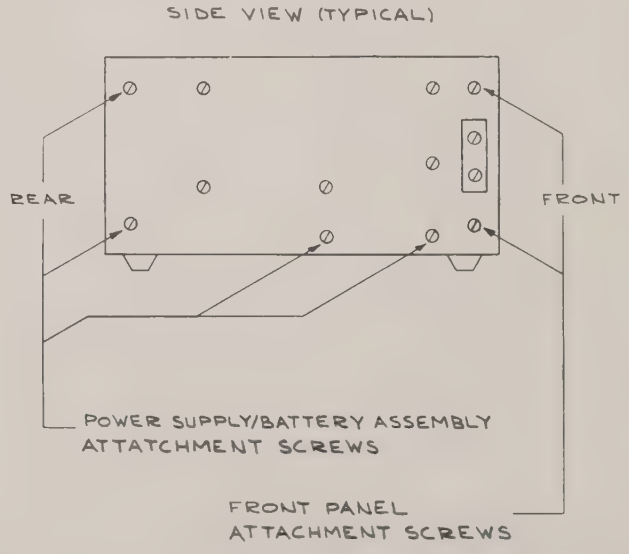

FIGURE 2-1 ASSEMBLY/DISASSEMBLY SCREW LOCATIONS

SECTION 3.0
OPERATION

3.1 GENERAL

This section contains a description of the controls and indicators, operation procedures, and methods of measurement to be used for the Model 42-01. Prior to operation, be sure that all connections to the instrument are made in accordance with instructions in Section 2.0.

The Model 42 Block Diagram is shown in Figure 5-1*. The generator section consists of a crystal-controlled spectrally pure 1004 Hz test tone sine wave generator and a continuously variable voltage-controlled oscillator (VCO) which may be frequency-locked in 100.4 Hz (100 Hz optional) step intervals. For fixed frequencies other than 1004 Hz, the unit is internally connected in the 100.4 Hz step mode. The desired mode of operation is selected by the front-panel pushbutton switches. The desired signal is then fed to the send amplifier whose amplitude is controlled by the front-panel generator LEVEL control.

The receiver can be selected to measure either level or noise. In the noise mode, a 1010 Hz Notch Filter is inserted before the noise-weighting filters. When a desired mode has been selected, the signal is then fed to the autorange amplifier, detectors, and digital voltmeter. Connections are also made to the frequency counter and audio monitor amplifier.

The master clock consists of a crystal-controlled 2 MHz oscillator from which all other timing pulses are derived. This oscillator is also used to derive the fixed 1004 Hz test tone.

The unit is powered from either the ac power line or optional rechargeable batteries. The power supply assembly contains the battery chargers, regulated ±9 V dc and a regulated +5 V dc used to operate the displays.

3.2 CONTROLS AND INDICATORS

The controls and indicators used in the operation of the Model 42-01 are described in Table 3-1. All controls are located on the front panel and are shown in Figure 1-1. No internal adjustments are required during normal operation.

TABLE 3-1
CONTROLS AND INDICATORS

DESIGNATION	FUNCTION
RECEIVE Pushbutton Switches	Selectes either 600 Ω or 900 Ω impedance, terminated or bridged modes.
DBRN Pushbutton Switches	Selects and places the 3 kHz, 15 kHz, C-Message, or Program Weighting Filter, in series with the Notch Filter. When any of the noise weighting filters is selected, a quasi-rms detector is used and the LEVEL displays dBrn directly. When noise measurements are being made, the Frequency kHz counter display is blanked.

*See foldouts at rear of manual.

DBM Pushbutton Switches	Selects either send or receive level. The average detector is used for level measurement and causes the level meter to display level directly in dBm. In this mode, the counter displays the frequency of the measured signal.
GENERATOR Pushbutton Switches	Selects the desired generator mode.
FREQUENCY Control	Selects the desired frequency in continuous or 100.4 Hz stepped mode of operation.
LEVEL Pushbutton Switches	Selects either the fixed level (-13 dBm), variable level, or the quiet termination (OFF).
LEVEL Control	Sets the desired output level in the variable mode.
SEND Pushbutton Switches	Selects either 600 Ω or 900 Ω impedance and sets the dBm reference impedance for the generator.
MONITOR Control	Controls the monitor speaker level.
NOISE TO GND/NORMAL Switch	Selects the noise-to-ground measurement mode when one of the noise-weighting filters is selected. The level meter display reads directly in dBrn without any corrections or dB additions.
SEND/REC Transfer Switch	Selects which of the 310 jacks is internally connected for the send/receive measurements. Transfers the send/receive function for 2-wire operation.
2W HOLD/OFF Switch	Places an electronic hold circuit across the line connected to the adjacent 310 jack.
DIAL/TALK/MEAS Switch	Internally connects the dial/talk connector to the 310 jack adjacent to the HOLD switch. The line connected to this 310 jack can then be used for dial-up or holding.
AC/OFF/(BATT) Switch	Controls the ac primary power or battery power (optional) to the instrument.
Battery Meter (optional)	Provides visual indication of state of charge of internal batteries. For proper indication, the ac power cord should be disconnected and the power switch set to BATT position.
2W/4W Switch	Selects either the 2-Wire or 4-Wire mode of operation for complete dial/talk capability.

3.3 OPERATING ADJUSTMENTS

This section presents the operational adjustments used with the Model 42-01 Transmission Test Set. Connections to the send and receive jacks should be made in accordance with the instructions given in Section 2.0.

3.3.1 RECEIVE MEASUREMENTS

This section contains the detailed operational instructions to be used for the level meter.

3.3.1.1 RECEIVE INPUT IMPEDANCE

Select the receiver reference impedance by pressing either the 600 Ω or 900 Ω pushbutton. Select either the terminated or bridged mode by pressing either the TERM or BRIDGE pushbutton.

3.3.1.2 LEVEL MEASUREMENT

When the receive input impedance has been properly selected press the DBM REC pushbutton switch. This selects the average detector and indicates level directly in dBm referenced to the selected receive input impedance.

The range of level measurement is -80 to +10 dBm. When the input is above or below this range, the display numbers will go blank, leaving an illuminated + sign when the input is above +10 dBm or a - sign when it is below -80 dBm.

3.3.1.3 MESSAGE CIRCUIT NOISE MEASUREMENT

Message circuit noise is measured by pressing the C-MSG, 3 KHZ, 15 KHZ, or PROG filter pushbutton. A 1010 Hz notch filter is automatically inserted before the selected noise-weighting filter. All noise measurements are read out directly in dBrn.

The range of noise measurements is +10 to +100 dBrn. When the input is above or below this range, the display numbers will go blank, leaving an illuminated + sign when the input is above +100 dBrn, or a - sign when it is below +10 dBrn.

3.3.1.4 NOISE-TO-GROUND MEASUREMENT

Noise-to-ground measurements are made by placing the NOISE TO GND/NORMAL switch in NOISE TO GND position. One of the noise-weighting filter pushbuttons must also be pressed. The level meter display reads directly in dBrn without any corrections or dB additions.

The ground connection to the test set may be made to either the front-panel ground post or the sleeve(s) connection of either the SEND or RECEIVE front-panel 310 jacks.

The range of noise measurements is +40 to +130 dBrn. When the input is above or below this range, the display numbers will go blank, leaving an illuminated + sign when the input is above +130 dBrn, or a - sign when it is below +40 dBrn.

3.3.2 FREQUENCY MEASUREMENT

The input to the frequency counter is controlled by the DBM pushbuttons. The input to the counter is selected by pressing either the SEND or REC pushbutton. When a noise measurement is being made, the counter display is automatically blanked.

If the frequency display is all 0's when the REC pushbutton is pressed, the receive input level is below approximately -45 dBm.

3.3.3 AUDIO MONITOR

The input to the audio monitor is controlled by the DBM and DBRN pushbuttons. The level to the audio monitor is controlled by the front-panel MONITOR control.

3.3.4 GENERATOR

This section contains the detailed operational instructions to be used for the Model 42-01 generator. To measure the generator frequency and level, press the DBM pushbutton marked SEND. Select the desired output impedance by pressing either the 600 Ω or 900 Ω SEND pushbuttons.

3.3.4.1 CONTINUOUS MODE

Press the GENERATOR-KHZ pushbutton marked CONT. Use the FREQUENCY and LEVEL controls to adjust for the proper output as indicated on the displays.

3.3.4.2 100.4 HZ STEP MODE

Press the GENERATOR-KHZ pushbutton marked STEP. The FREQUENCY control can now be used to adjust the output frequency in 100.4 Hz steps.

3.3.4.3 FIXED FREQUENCY MODE

Press the desired frequency pushbutton. This automatically selects the 100.4 Hz step mode at the proper frequency.

When the 1.004 kHz pushbutton is pressed, the normal generator output is disabled and the unit selects the crystal-controlled spectrally pure 1004 Hz test tone. The output level is adjusted using the LEVEL control.

3.3.4.4 SEND LEVEL MEASUREMENT

The send level mode is selected by pressing the desired LEVEL push-button. In the OFF condition, a quiet termination is applied to the output terminals. In the VAR mode, the output level is adjusted using the front-panel LEVEL control. The third LEVEL pushbutton applies a fixed level (typically -13 dBm) to the output terminals.

In accordance with telephone company transmission level practices, the send level measurement is calibrated in terms of the level that will exist at the send terminals when they are properly terminated in the impedance selected by the SEND pushbutton switches. If the actual

terminating impedance is different from the selected impedance (600 Ω or 900 Ω), send levels other than that indicated will exist at the send terminals. The actual level across the send terminals may be verified using an external meter or temporarily bridging the Model 42-01 receive input (in the bridge mode) across the send terminals. The receive impedance must be the same as the send impedance.

3.3.5 DIAL/TALK OPERATION

This section contains the operational instructions to be used for either 2-Wire or 4-Wire dial/talk mode of operation.

3.3.5.1 2-WIRE DIAL/TALK

Press the RECEIVE-BRIDGE pushbutton. Set the 2W/4W switch to 2W. Connect the lineman's set to the DIAL/TALK connectors. Place the DIAL/TALK switch in the DIAL/TALK position. This connects the lineman's set across the input line. Using the lineman's set, dial-up the desired line. When the desired connection has been made, place the 2W HOLD/OFF switch to 2W HOLD position and the DIAL/TALK switch to MEAS position. Normal measurements can then be made with the dialed-up line. Communications on a dialed-up line can be made by placing the DIAL/TALK switch to DIAL/TALK position. The lineman's set may be left connected without adversely affecting the performance of the Model 42-01.

3.3.5.2 4-WIRE DIAL/TALK

The Model 42-01 supplies an internal talk battery in the 4-Wire DIAL/TALK mode. The unit will interface with both wet and dry 4-Wire facilities and will provide full talk/listen operation without external batteries.

Press the RECEIVE-BRIDGE pushbutton. Connect the headset to the 4-Wire connectors. Set the 2W/4W switch in the 4W position. Set the DIAL/TALK switch in the DIAL/TALK position. This internally connects the headset receiver to the output of the input amplifier and connects the headset microphone to the input of the output amplifier. The talk and listen functions on the incoming lines can be interchanged by reversing the SEND/RECEIVE transfer switch.

Normal measurements can be made by placing the DIAL/TALK switch in the MEAS position. Communications over the lines can be made by placing the DIAL/TALK switch in the DIAL/TALK position. The headset may be left connected without affecting the performance of the Model 42-01.

3.3.6 BATTERY CHECK (OPTIONAL)

When supplied with the optional rechargeable battery pack, the Model 42-01 will always be recharged when the line cord is plugged into an active power outlet. The front-panel power switch does not control the charging function.

The battery meter will give a visual indication of the state of charge when the AC/BATT switch is in the BATT position. For proper indication, the ac line cord must be disconnected. (With the ac line cord connected, the meter monitors the output of the battery charger.)

The batteries should be recharged whenever the battery meter indication is in the lower half of the green scale. The unit will continue to operate until the battery meter moves into the red.

SECTION 4.0
THEORY OF OPERATION

4.1 GENERAL

This section provides a general theory of operation followed by detailed circuit operation on a functional block basis. The Model 42-01 is entirely solid state and makes extensive use of integrated circuit operational amplifiers and CMOS digital logical circuits. Discussions of conventional transistor circuitry, operational amplifier theory and digital logic circuitry are available in a number of current reference texts. The Model 42-01 block diagram shown in Figure 5-1 is discussed in the following sections.

4.1.1 LEVEL/NOISE METER

The input circuitry bridges or terminates 600 Ω and 900 Ω receive lines. The input signal is then transformer-coupled to the input amplifier which is directly connected to the autoranging circuitry for level measurements, and drives the 1010 Hz notch and noise weighting filters for noise measurements. The autorange circuitry, which may monitor either the receive or send signals, automatically adjusts the amplifier gain to keep the received signal level within the range of the noise and level detectors. The dc output of the selected detector is applied to the log converter. The log converter changes the linear voltage output of the detectors to a logarithmic output to allow a display of the level and noise directly in dB. The digital voltmeter takes the output of the log converter and control signals from the autorange amplifier and converts these to the 3-digit display of noise or level.

A front-panel controlled monitor speaker is also provided which allows the operator to audibly monitor the input signal.

4.1.2 FREQUENCY COUNTER

A 4-digit frequency counter with autoranging display monitors the signal applied to the level/noise meter. The counter uses a large scale integration (LSI) CMOS IC to perform the frequency counting operation and drive the 4-digit multiplexed display.

4.1.3 GENERATOR AND CLOCK

The tuneable frequency generator uses a voltage-controlled oscillator (VCO) operating at 40 times the output frequency to drive a low distortion stairstep sine wave generator. The generator output is processed by four programmed filters to provide excellent spectral purity. Continuous frequency control or locked 100.4 Hz (100.0 Hz) steps using frequency lock circuitry in the VCO may be front-panel selected. In the fixed frequency mode of operation, the Model 42-01 internally selects the 100.4 Hz step mode with a pre-set VCO control voltage. A separate circuit, consisting of a fixed frequency divider and 2-pole 1004 Hz bandpass filter, generates a high stability, high purity 1004 Hz holding tone.

The selected generator signal is applied to the send amplifier where the output level is controlled and then to the output driver which

transformer-couples the selected generator signal at either a 600 Ω or 900 Ω impedance level to the send terminals.

A 2 MHz master clock oscillator is used to generate the various clock, control, updating and locking frequencies required in the operation of the noise/level meter, frequency counter and generator sections. The master clock is crystal-controlled.

4.1.4 POWER SUPPLY

The power supply provides the ±9 V and +5 V used in the Model 42-01. The supply is designed to operate directly from the ac line using a transformer and bridge rectifier to supply an internal ±21 V dc. All voltages are electronically regulated for accuracy and long-term stability, compensating for temperature and line voltage fluctuations.

When supplied with the optional rechargeable battery pack, the Model 42-01 may be operated directly from the battery pack or from the ac line. The battery pack is recharged when the line cord is plugged into an active power outlet.

4.2 DETAILED CIRCUIT OPERATION

The following sections describe the detailed circuit operations for the level/noise meter, frequency counter, generator and clock, and power supply. Schematics and timing diagrams are presented in Section 5.0. Odd numbered figures are foldouts (schematics, etc.);even numbered are component layouts facing schematics.

4.2.1 LEVEL/NOISE METER

4.2.1.1 INPUT CIRCUIT (42-101 BOARD)

The input signal is connected to the front-panel RECEIVE jack (Figure 5-1). It is then routed to the 42-101 board (Figure 5-3) which contains the dc isolation capacitors, the TERM switch S3, and the 600/900 Ω terminating resistors and selection switches. The signal is then transformer-coupled to input amplifier IC1. This wideband low-noise op-amp drives the level and noise filter circuitry and provides the received signal for 4-Wire dial/talk.

4.2.1.2 NOISE FILTERS (42-101 BOARD)

Input amplifier IC1 drives 4-pole notch filter IC16, IC15, IC14, IC13, and IC12. This filter makes use of four active notch filters with excellent overall stability. The notch design has a passband loss of approximately 6 dB and each pole is provided with individual frequency and depth adjustments.

The 3 kHz flat filter (IC8A), 15 kHz flat filter (IC8B, IC9) Program filter (IC6 and IC7) and C-Message filter (IC9, IC10, and IC11) use conventional active filter techniques to generate the noise weighting characteristics.

4.2.1.3 LEVEL MEASUREMENT (42-101 BOARD)

Switches S5 through S9 select either the noise signal or level signal for routing to the FET gate Q3 and Q4.

The send signal is connected to FET gates Q1 and Q2. These gates provide both a transmission gate and a short-to-ground to minimize signal crosstalk. The 600 Ω and 900 Ω gain adjustment is controlled by switches S1, S2, S3 and resistors R72 through R76.

4.2.1.4 AUTORANGE AMPLIFIER (42-101 BOARD)

The autorange amplifier accepts the noise, receive level or send level signal and adjusts its gain in 20 dB steps to keep the signal level within the detector operation range.

The autorange amplifier consists of 3 cascaded 20 dB gain amplifier stages with individual FET gates to select the desired amplifier output.

The three amplifiers (IC2, IC3, and IC4) are identical and include a 20 dB gain amplifier stage with dc blocking, level detector diodes, a detector amplifier and a transistor logic gate which, in conjunction with the other amplifiers, opens the proper FET gate Q10, Q11, Q12, or Q13 to connect the output to the signal detector circuitry. Logic diodes D17, D18, D19 and D20 and driver transistors Q5, Q6 generate the range-control signals for the digital display so that it matches the selected range of the autorange amplifier.

The low-pass filter IC18 reduces the noise bandwidth of the signal to the detectors.

4.2.1.5 DETECTORS (42-201 BOARD) (Refer to Figure 5-5.)

The autorange amplifier output is connected through the flat cable to the 42-201 board and applies a signal to the quasi-rms detector used for noise detection and the average detector used for level detection. The detectors use a common full-wave rectifier circuit, IC26, which provides individual outputs for the average detector, IC28B, and the quasi-rms detector, IC27 and IC28A. Both detectors incorporate dc bias adjustments.

The desired detector output is selected by electronic switch IC29 which is controlled by the noise and level switches. The detector output is buffered by IC30 and connected to the log converter.

4.2.1.6 LOG CONVERTER (42-201 BOARD)

The log converter takes the detected signal output and converts it to a gated clock signal whose duration is proportional to the logarithm of the input.

Capacitor C10 is charged to the detector output level through IC31. Every 320 ms, the capacitor is disconnected from the detector and allowed to discharge to the reference voltage set by D1 and R26 through R29. The discharge period is converted to a pulse by IC32 and IC21. This pulse is synchronized with the 100 kHz clock by flip-flop IC22 to prevent partial clock pulses.

4.2.1.7 DIGITAL VOLTMETER (42-201 BOARD)

The gated clock output from the log converter, the range information from the autoranging amplifier, the update clock, and the unit (dBm, dBrn) control signals are processed by the digital voltmeter to provide a 3-digit plus sign level and noise readout directly in dBm/dBrn.

The number to be displayed is accumulated in the four pre-set decade counters IC9, IC10, IC11, and IC12. These counters take the gated clock pulse from the log converter and accumulate the hundredths, tenths, units and tens digits. The pre-set circuitry takes the range information from the autoranging amplifier and pre-sets the counters to the correct 20 dB range. Two sets of pre-set numbers are used: one for dBm level measurements and the other for dBrn noise measurements. The outputs of the pre-set counters are fed to the display latches, IC15, IC6, and IC7 which drive the 7-segment displays.

Overrange blanking is controlled by the overrange detectors, IC24A, IC24B, which process the range and level information from the autoranging amplifier and the detector output to determine overrange/underrange conditions. The remaining digital logic provides half-digit and polarity displays, control of the decimal point, and blanking of the tenths dB digit during noise measurements.

4.2.1.8 MONITOR (42-201 BOARD)

The level or noise signal selected for display may also be monitored with the internal monitor amplifier and speaker.

The monitor signal is obtained from the output of the input amplifier of the autorange amplifier. It is routed to the 42-400 board and the front-panel monitor gain control. This control is connected to monitor amplifier IC22 and monitor driver transistor Q1, Q2. These transistors provide a low impedance drive directly to the monitor speaker.

4.2.2 FREQUENCY COUNTER (42-304 BOARD) (Refer to Figure 5-7.)

The frequency counter provides a 4-digit autoranging display. It makes use of a large scale integrated (LSI) counter IC with multiplexed display and the necessary external circuitry to provide analog signal processing, gating, reset/updating and leading zero suppression.

The counter analog input is derived from the third stage of the autoranging amplifier and is converted to logic levels by IC8 and IC9.

The input frequency is increased by a factor of 10 by IC6 and IC7 if the frequency is below 10 kHz. This allows rapid updates of the counter display rather than the one per second which is commonly provided for 1 Hz resolution.

When the input frequency is greater than 10 kHz, the output of the frequency multiplier is disabled and the output of IC8 is connected to the count circuitry.

A 100 Hz clock signal is processed by counter IC6 and flip-flop IC15A to provide the count gate. Reset and update pulses are generated by gates IC16 and IC17 with their corresponding RC time constants. Leading zero suppression is provided by flip-flop IC21 and logic gates IC16, IC19.

The counter display is turned off when any of the noise weighting filters is selected.

4.2.3 GENERATOR AND CLOCK

4.2.3.1 CLOCK (42-204 BOARD)

The clock circuitry uses a 2 MHz crystal oscillator, Y1, IC5, and a divider chain, IC10, IC11, IC12 to provide the 500 kHz clock to the fixed frequency divider circuitry; the 100 kHz clock to the log converter; the 100 Hz clock to the frequency counter, generator lock circuitry, log converter and digital voltmeter; and the 2.5 kHz clock to the 5 V power supply.

4.2.3.2 1004 HZ GENERATOR

The 1004 Hz generator provides the high accuracy, low-distortion holding tone for the generator section.

A feedback counter arrangement on the 42-404 board uses gates IC2, IC1 to divide the 500 kHz clock signal by 249. A final ÷2 stage, IC4, provides a symmetrical square wave to the 2-pole bandpass filter IC1 on the 42-404 board. The filter provides better than 60 dB harmonic rejection, providing a high purity sine wave at 1004.016 Hz. The filter output is fed to the 1004 Hz switch S2 used to select the desired generator output.

4.2.3.3 TUNEABLE GENERATOR (42-404 BOARD) (Refer to Figure 5-9.)

The tuneable generator uses a frequency-locked oscillator, 100.4 Hz lock circuitry, a waveform generator and switchable filters to generate the variable frequency generator signal.

The frequency-locked oscillator, IC3, operates at 20 times the generator output frequency and covers the range from 4 kHz to 400 kHz. An internal phase detector together with R28 and C9 doubles the oscillator output frequency by providing a pulse for each zero crossing. Its output is changed to a BCD number by counter IC8 which drives the BCD to decade decoder IC9. The decoder outputs drive a precision resistor network which generates, as a result of the up/down counter operation, a 20-step replica of a positive half sine wave. This stairstep replica is buffered by amplifier IC10A and is inverted every other half cycle by switched amplifier IC10B. This amplifier is switched from the inverting to the non-inverting configuration by two transmission gates under the control of flip-flop IC4.

Switchable filter IC19B filters the stairstep half sine wave to provide a smooth, low-distortion sine wave. Four filter bandwidths are selected by the transmission gates controlled by threshold detectors IC17 and IC18. These threshold circuits monitor the frequency-locked oscillator dc control voltage, which is proportional to frequency, to control the range over which each filter bandwidth is used.

The frequency-locked oscillator may be tuned continuously using the front-panel frequency control or locked in 100.4 Hz steps using the front-panel STEP switch. In the locked mode, the 100.4 Hz clock signal is buffered by amplifier IC14 and samples the sine wave generator output in transmission gate IC13. In the locked mode, this signal is summed through transistor Q3 with a voltage proportional to the frequency-locked oscillator frequency derived by the charge pump discriminator IC5, integrated by integrator IC6A, and applied to the oscillator frequency control input.

4.2.3.4 OUTPUT AMPLIFIER (42-404 BOARD)

The 1004 Hz fixed or tuneable generator outputs are selected by S2 and IC15 and applied to either the front-panel generator send level control or the fixed level control. The signal is then connected to output amplifier IC20 on the 42-404 board. This signal is coupled to final output amplifier IC21 which provides the transformer-coupled balanced output signal to the impedance determining networks and dc isolation capacitors.

The send level measurement signal and adjustment are provided after output amplifier IC20. Switches S9 and S10 select the output impedances and the proper output levels.

4.2.4 POWER SUPPLY (42-500 BOARD) (Refer to Figure 5-11.)

The ac line is connected through the fuse and front-panel power switch to power transformers T1, T2. The secondaries of the power transformers are connected to the diode bridge, D2 on the 42-500 board. The diode bridge is connected to filter capacitor, C9, C10, and to the plus and minus voltage regulators.

The +9 V regulator consists of transistors Q4 through Q8 and their associated components. The -9 V regulator consists of transistors Q9 through Q12 and their associated components. Transistor Q13 is connected across the regulator outputs to provide a tracking control voltage to the negative regulator.

The 5V display power supply uses a 2.5 kHz switching regulator to maximize efficiency. The 5 V output is compared with the -9 V summing integrator IC3B. The error voltage from IC3B is compared with a reference set by the 2.5 kHz clock in IC3A to control the on-time of pass transistor Q15 and Q17.

Transistors Q18, Q19 and Q20 provide current limiting for the 5 V supply.

When the optional battery pack is used, the diode bridge output is connected to the battery chargers IC1, IC2. These battery chargers are both current-limited and voltage-regulated to prevent overcharging of the battery pack. The battery charger consists of integrated circuit voltage regulators IC1, IC2 with external pass transistors Q2, Q3.

4.2.5 HOLD CIRCUIT

The electronic hold circuit is located on the 42-600 board and provides a constant 26 mA current sink when switched across an active line. Diode bridge D1 is used to provide a polarity insensitive circuit.

4.2.6 DIAL/TALK

The Dial/Talk circuitry is located on the front panel and consists of switches S4, S5 and 310 jacks J3, J4.

In the 2-Wire mode of operation, the input circuitry is disconnected from the input 310 jack and the 2-Wire dial/talk jack is connected to the input jack.

In the 4-Wire mode of operation, the output of the input buffer amplifier is connected to the 4-Wire earphone and the output from the 4-Wire

microphone is connected to the output amplifier. Power for the microphone is provided by R6 and the +9 V supply bus.

MANUAL ADDENDUM

MODEL 42

DUAL RANGE OUTPUT LEVEL CONTROL

GENERAL

The Model 42 Dual Range Output Level Control option extends the send output level range from +10 dBm to -40 dBm to +10 dBm to -65 dBm. The range is controlled by the front panel HI/LO switch. With the switch in the HI position, the output level is adjustable over the range of +10 dBm to -45 dBm with increased setability over the range of +10 dBm to -30 dBm. With the switch in the LO position, the output level is adjustable over the range of -20 dBm to -70 dBm with increased setability over the range of -25 dBm to -65 dBm.

The fixed level output is not affected by this option and can be selected by depressing the fixed level pushbutton independent of the position of the HI/LO switch.

OPERATION

Send level measurements are discussed in Section 3.4.4.4 of the Model 42 Operating Manual. In the variable mode, the output level is adjusted using the front panel level control and HI/LO switch. For levels of +10 dBm to -30 dBm, the HI range should be used. For levels of -25 dBm to -65 dBm, the LO range should be used.

For levels below approximately -45 dBm, the frequency counter will not operate. To monitor the send frequency at low levels, either set the HI/LO switch to the HI position or depress the fixed level pushbutton. Once the frequency has been adjusted, set the HI/LO switch to the LO position and depress the variable level pushbutton.

SECTION 5.0
MAINTENANCE AND CALIBRATION

5.1 MAINTENANCE PHILOSOPHY

Maintenance procedures for the Model 42 are divided into preventive and corrective classifications. Preventive maintenance consists of a routine performance check which may be made using the front-panel controls of the instrument. Corrective maintenance covers the symptom analysis, trouble-shooting, repair, and recalibration of the instrument.

5.2 PREVENTIVE MAINTENANCE

5.2.1 GENERAL

The preventive maintenance procedures described in the following sections are used by the operator and maintenance personnel to verify proper instrument operation using the front-panel controls. If proper operation is not achieved, see Section 5.3 for corrective maintenance procedures.

Periodic cleaning, lubrication or inspection of the Model 42 is not required.

The following checks are made by looping the Model 42 output to the Model 42 input. Connections between the output and input terminals may be made using an appropriate test cord.

5.2.2 GENERATOR

This section contains the self-checks that may be used for the generator section of the Model 42. If proper operation of the Model 42 receiver section is in doubt, an external frequency counter and voltmeter may be used to check the generator.

5.2.2.1 1004 HZ GENERATOR

Press the following 42 pushbuttons: upper row - REC, TERM, 600 Ω; lower row - 1.004, VAR, 600 Ω. Connect the input and output terminals together with an appropriate test cord. Using the send LEVEL control, adjust the output for a reading of ±0.0 dBm. The kHz counter should indicate 1.004 Hz ±1 Hz. Press the C-MSG pushbutton and verify that the display indicates less than +40 dBrn.

5.2.2.2 FREQUENCY RANGE

Press the DBM pushbutton marked REC and the GENERATOR pushbutton marked CONT. Using the front-panel FREQUENCY control, vary the frequency over its entire range and verify that the frequency range covers at least 200 Hz to 20 kHz.

5.2.2.3 100.4 HZ STEP

Press the GENERATOR pushbutton marked STEP. Using the front-panel FREQUENCY control, vary the frequency over the range 200 Hz to 20 kHz and verify that the frequency changes in 100.4 Hz steps.

Press the fixed frequency pushbuttons and verify that the counter indicates the correct frequency ±1 Hz.

5.2.2.4 GENERATOR LEVEL RANGE

Press the GENERATOR pushbutton marked 1.004. Using the front-panel LEVEL control, vary the level over its range and verify that the send level includes the range +10.0 dBm to -40.0 dBm.

Press the fixed level pushbutton and verify that the display indicates the correct level ±0.2 dB.

5.2.3 FREQUENCY COUNTER

Using the generator frequency control, vary the frequency from 200 Hz to 20 kHz and verify that the frequency counter follows the generator output and autoranges from the 1 Hz resolution to 10 Hz resolution at a frequency of 10 kHz.

Press each of the noise-weighting pushbuttons in turn and verify that the frequency display blanks in each case.

5.2.4 AUDIO MONITOR

Press the DBM pushbutton marked SEND and the GENERATOR pushbutton marked 1.004. Using the front-panel LEVEL control, adjust the send level for a reading of 0.0 dBm. Adjust the MONITOR level control and verify the presence of a 1004 Hz tone from the speaker. The speaker output should increase in level as the MONITOR control is turned clockwise.

5.2.5 RECEIVER

This section contains the various checks for the receive section. Once proper operation of the generator section has been verified, the generator may be used as the input signal to the receiver.

5.2.5.1 FREQUENCY RANGE

Press the RECEIVE pushbuttons marked 600 Ω and TERM, DBM pushbutton marked REC, the LEVEL pushbutton marked VAR, the GENERATOR pushbutton marked CONT, and the SEND pushbutton marked 600 Ω. Using the front-panel FREQUENCY control, adjust the generator FREQUENCY control for an indicated frequency of 1000 Hz ±10 Hz. Using the front-panel LEVEL control, adjust the generator output level to 0.0 dBm ±0.1 dBm. Using the FREQUENCY control knob, adjust the frequency for 200 Hz to 4 kHz and verify that the display indicates 0.0 dBm ±0.3 dBm. Vary the frequency from 4 kHz to 20 kHz and verify that the display indicates 0.0 dBm ±0.5 dBm.

5.2.5.2 LEVEL RANGE

Place an external attenuator with an overall accuracy of ±0.1 dBm or better between the send output and the receive input. Adjust the generator and attenuator for an input of 0.0 ±0.1 dBm at a frequency of 1000 Hz ±10 Hz. Vary the input level over the range of +10.0 to -40.0 dBm and verify that the display indicates the correct level, ±0.3 dBm. Vary the input level over the range of -40.0 to -70.0 dBm and verify that the display indicates the correct level, ±1.0 dB.

5.2.5.3 C-MESSAGE FILTER

With the C-MSG pushbutton in, adjust the input frequency to 2000 Hz ±10 Hz. Adjust the level so that the display flashes between +89 and +90 dBrn. Without changing the input level, change the input frequency to 3800 Hz ±20 Hz and verify that the display indicates +80 dBrn ±3 dBrn.

Set the input frequency to 2000 Hz ±10 Hz at a level of +90 dBrn. Without changing the level, change the input frequency to 1000 Hz ±10 Hz. Verify that the display indicates +40 dBrn or less.

5.2.5.4 3 KHZ FILTER

With the 3 KHZ pushbutton in, set the input to a frequency of 400 Hz ±10 Hz. Adjust the level so that the display flashes between +89 and +90 dBrn. Without changing the input level, change the input frequency to ~~300 Hz~~ 3000HZ ±10 Hz and verify that the display indicates +87 dBrn ±2 dBrn.

5.2.5.5 15 KHZ FILTER

With the 15 KHZ pushbutton in, set the input to a frequency of 200 Hz ±10 Hz. Adjust the level so that the display flashes between +89 and +90 dBrn. Without changing the input level, change the input frequency to 15.00 kHz ±0.02 kHz and verify that the display indicates +87 dBrn ±2 dBrn.

5.2.5.6 PROGRAM FILTER

With the PROG pushbutton in, set the input to a frequency of 4.50 kHz ±0.02 kHz. Adjust the level so that the display flashes between +89 and +90 dBrn. Without changing the input level, change the input frequency to 8.75 kHz ±0.02 kHz and verify that the display indicates +84 dBrn ±3 dBrn.

5.3 CORRECTIVE MAINTENANCE

5.3.1 TROUBLESHOOTING

This section covers symptom analysis, circuit level troubleshooting and calibration procedures for the Model 42.

Accepted practices should be followed when repair is undertaken on mainframe components or the printed circuit boards. Recommended troubleshooting techniques are based on signal tracing methods where a known input signal is used and the level and waveforms are verified as the signal progresses through the circuitry.

To gain access to the printed circuit board test and calibration points, the following procedure may be used:

Step 1. Remove the desired pair of printed circuit boards using the procedures in Section 2.3.1.

Step 2. Insert the appropriate printed circuit extension board in the Model 42.

Step 3. Separate the board pair boards by removing the five mounting screws on either of the two boards.

Step 4. Insert the board pair into the socket on the extension board.

5.3.2 SYMPTOM ANALYSIS

The preventive maintenance checks of Section 5.2 are used to isolate the area in which malfunction occurs. Table 5-1 summarizes possible fault location for each of the preventive maintenance tests.

TABLE 5-1
SYMPTOM ANALYSIS

PREVENTIVE MAINTENANCE TEST	PROBABLE TROUBLE LOCATION
1. No response from any test	a. AC power cord
	b. Fuse
	c. Internal ac wiring or power switch
	d. Power supply
	e. Battery pack (optional)
2. 1004 Hz generator check (5.2.2.1)	a. Output amplifier IC20, IC21 (42-400)
	b. 1004 filter IC1 (42-400)
	c. 1004 Hz divider IC1, IC2, IC3, or IC4 (42-300)
	d. Crystal oscillator or divider IC5,
	e IC10, or IC11 (42-300)
	e. 1004 Hz switch S2 (42-400)
3. Generator frequency check (5.2.2.1)	a. VCO IC3 (42-400)
	b. Divider IC7, IC8, IC9 (42-400)
	c. Sine wave converter IC10, IC11 (42-400)
	d. Output filters IC9, IC11, IC12, IC13 (42-400)
	e. Discriminator IC5 (42-400)
	f. VCO control IC6, IC15 (42-400)
4. 100.4 step test (5.2.2.3)	a. 100.4 Hz input IC13, IC14 (42-400)
	b. 100.4 lock IC6, Q3 (42-400)
	c. Fixed frequency control IC14 (42-400)
5. Level range check (5.2.2.4)	a. Output amplifier IC20, IC21 (42-400)
	b. Output transformer T1 (42-400)
6. Frequency counter check (5.2.3)	a. Input or autorange amplifiers IC1, IC2, IC3, IC4, IC17 (42-100)
	b. Input IC8, IC9 (42-300)
	c. Resolution control IC6, IC7, IC13, IC14 (42-300)
	d. Counter control IC16, IC17, IC18, IC19, IC20 (42-300)
	e. Digit drivers Q1, Q2, Q3, Q4, IC20 (42-300)
	f. Segment drivers Q5, Q6, Q7, Q8, Q9, Q10, Q11, IC20 (42-300)
7. Audio monitor check (5.2.4)	a. Input amplifier IC1 (42-100)
	b. Summing amplifier IC18 (42-100)
	c. Monitor amplifier IC22, Q1, Q2, (42-400)

TABLE 5-1 continued

PREVENTIVE MAINTENANCE TEST	PROBABLE TROUBLE LOCATION
8. Receive frequency range check (5.2.5.1)	a. Input amplifier IC1 (42-100) b. Autorange amplifier IC17, IC2, IC3, IC4 (42-100) c. Detectors IC26, IC27, IC28, (42-200) d. Log converter IC20, IC31, IC32 (42-200)
9. Receive level check (5.2.5.2)	a. Autorange amplifier IC17, IC2, IC3, IC4 (42-100) b. DVM control IC14, IC15, IC16, IC17, IC19 (42-200) c. DVM counters, IC9, IC10, IC11, IC12, (42-200) d. DVM display drivers IC5, IC6, IC7 (42-200)
10. C-Message filter check (5.2.5.3)	a. C-MSG filter IC9, IC10, IC11 (42-400) b. Switch S8 (42-100) c. Notch filter IC13, IC14, IC15, IC16 (42-100)
11. 3 kHz filter check (5.2.5.4)	a. 3 kHz filter IC8A (42-100) b. Switch S7 (42-100) c. Notch filter
12. 15 kHz filter check (5.2.5.5)	a. 15 kHz filter IC8B (42-100) b. Switch S6 (42-100) c. Notch filter
13. Program filter check (5.2.5.6)	a. Program filter IC6, IC7 (42-100) b. Switch S5 (42-100) c. Notch filter

5.3.3 CIRCUIT LEVEL TROUBLESHOOTING

The following sections describe the general procedures to be used in locating malfunctions. Where appropriate, performance standards, voltage levels, or waveform descriptions are provided to assist in the troubleshooting procedure. Unless otherwise stated, all voltage and frequency tolerances are ±10% and all dB tolerances are ±0.1 dB. When a circuit has the proper input signal, but the correct output cannot be measured, the components associated with that circuit should be checked and replaced if defective. Before detailed troubleshooting is undertaken, power supply voltages should be checked. Low supply voltages may result from a malfunctioning power supply or excessive current being drawn by a defective circuit. A defective integrated circuit may often be located by feeling the case temperature. Normally, the integrated circuits are moderately warm to the touch. However, when defective, they can become extremely warm, causing a painful sensation when touched.

5.3.3.1 POWER SUPPLY (42-304 BOARD) (Figures 5-6, 5-7, 5-14, 5-15)

The power supply consists of a dual tracking ±9 V dc regulated supply and a separate +5 V dc regulated supply used to drive the LED

displays. If the optional battery pack is supplied, then the power supply will also contain the battery chargers.

With the power switch in the AC position, the rectified voltage across filter capacitors C9 and C10 should be +21 V dc and -21 V dc, respectively. This dc voltage will vary with the ac line voltage, from 18 V dc for a low line voltage to 27 V dc for a high line voltage.

The +9 V dc output voltage is measured across C15. If a proper positive output voltage is measured, check the negative voltage regulator Q9, Q10, Q11 and Q12. If neither supply voltage is correct, initially check the positive regulator Q4, Q5, Q6, Q7, and Q8 which supplies the reference voltage to the negative voltage regulator through Q13.

The +5 V dc output voltage may be measured from the + side of C24 to ground. This voltage should be +5.0 V dc ±0.5 V dc. If this voltage is very positive, then Q15 may be defective. Proper regulation of the supply may be verified by observing the waveform at Pin 1 of IC13. This waveform should be +8 V dc with short pulses to -8 V dc occurring at a 2.5 kHz rate. The duration of these pulses controls the on-time of pass transistors Q15 and Q17. Under normal operation, there will be a slight variation in the duration of these pulses. If these pulses are excessively long, then the control transistors Q14, Q15, Q16 or Q17 may be defective.

To verify that improper operation of the power supply is not the result of an incorrect load, temporarily disconnect the cable connector from J1. (Disconnecting J1 will disable the 5 V regulator by removing the 2.5 kHz clock. The 2.5 kHz clock may be externally connected using a short clip lead from Pin 1 or Pin 16 of J1 to C27.) Remeasure the supply voltages. If these are normal, connect an ammeter in series with the test points and proper pin on J1. The value for both the plus and minus supplies should be about 135 mA. Currents substantially greater than these are a result of problems external to the power supply.

In units with the optional battery pack, the battery chargers may be checked by disconnecting the batteries from the unit. Check the battery charger open-circuit voltage at Terminals 6 and 9. This voltage should be +13.9 V dc and -13.9 V dc respectively. If these voltages are correct, measure the battery charger short-circuit current. This is done by placing an ammeter from Terminal 6 to ground or from Terminal 9 to ground. In both cases, this current should be in the range of 200 to 250 mA.

5.3.3.2 CRYSTAL OSCILLATOR AND DIVIDERS (42-300 BOARD)

Using an oscilloscope with a calibrated time base, monitor the signal at Pin 13 of IC10 on the 42-300 board. This signal should be a 1 MHz, 9 V square wave. If this signal is not correct, check the 2 MHz oscillator IC5 or the divide by two IC10.

Monitor the signal at Pin 10 of IC5. This signal should be a 9 V square wave at a frequency of 100 kHz and a duty cycle of 40/60.

Monitor the signal at Pin 13 of IC11. This signal should be a 9 V square wave at a frequency of 10 kHz and a duty cycle ratio of 40/60.

Monitor the signal at Pin 13 of IC12. This signal should be a 9 V square wave at a frequency of 100 Hz and a duty cycle ratio of 40/60.

5.3.3.3 1004 HZ FREQUENCY GENERATOR (42-300 BOARD)

Monitor the signal at Pin 11 of IC2. This signal should be a 6 V

pulse whose duration is approximately 1.5 µs occuring every 498 µs.

Monitor the signal at Pin 3 of IC4. This signal should be a 6 V square wave at a frequency of 1004 Hz with a duty cycle ratio of 50/50.

Monitor the signal at Pin 1 of IC1 on the 42-400 board. This signal should be a 1004 Hz sine wave at a level of 10.0 dBm ±1.5 dB.

5.3.3.4 FREQUENCY GENERATOR (42-400 BOARD)

Any malfunction in the frequency generator can best be isolated by waveform tracing using the timing diagram in Figure 5-16. Set the controls for a generator output of 100 Hz ±5 Hz at a level of 0.0 dBm ±0.5 dB.

Using the negative-going edge of waveform C as a trigger, verify the correct operation of the generator by observing the correct waveforms at the test points listed. If the correct waveform is not observed, the gate or counter associated with that waveform is most likely defective.

At frequencies other than 1000 Hz, the waveform shapes will be the same but the time base will be different.

5.3.3.5 100.4 HZ STEP (42-400 BOARD)

Using an oscilloscope, observe the waveform at Pin 1 of IC14. This waveform should be a short pulse varying from approximately -8 V to +8 V at a 100.4 Hz rate. The duration of the pulse at the bottom of the waveform should be approximately 30 µs.

If this waveform is not present, then IC14 is most likely defective. If this waveform is present, then IC13 or Q3 is most likely defective.

5.3.3.6 SEND OUTPUT FILTERS (42-400 BOARD)

Using an oscilloscope, observe the signal at Pin 7 of IC19. As the generator frequency is varied from 200 Hz to 20 kHz, this output should be a clean sine wave with a peak value of 1.1 V ±0.2 V. If this signal is not present or has wide variations in signal level as the frequency is varied, then IC19 is most likely defective. If this signal is present over a portion of the frequency range, then comparators IC18 and IC18 or switches IC11, IC12 and IC13 may be defective.

At a frequency of 300 Hz, Pin 1 of IC17 should be approximately +7.5 V and IC12 should be switched on. At a frequency of 1000 Hz, the voltage at Pin 1 of IC18 should be +7.5 V and IC11 should be switched on. At a frequency of 5000 Hz, Pin 7 of IC18 should be approximately +7.5 V and IC13 should be switched on.

5.3.3.7 OUTPUT AMPLIFIER (42-400 BOARD)

Adjust the operating controls for an output of 1000 Hz with a 600 Ω impedance. Using an ac voltmeter, monitor the signal at Pin 6 of IC20. As the LEVEL control is varied over its full range, this signal should vary over the range of at least -43.5 dB to +6.5 dB. If the signal does not vary at least over this range, then IC20 is most likely defective.

Monitor the signal at Pin 6 of IC21. This signal should vary over the range of at least -37.5 dB to +12.5 dB. If the signal does not vary over at least this range, then IC21 is most likely defective.

5.3.3.8 FREQUENCY COUNTER (42-300 BOARD)

Set the controls to monitor the send frequency and adjust the send frequency to 1000 Hz. Monitor the signal at Pin 6 of IC8. This signal should be a square wave at the send frequency.

Monitor the signal at Pin 4 of IC7. This signal should be a square wave at 10 times the send frequency.

Monitor the signal at Pin 10 of IC13. This signal should be a 0 V dc logic level. Change the send frequency to 11 kHz and verify that the signal at Pin 10 of IC13 switches to a +5 V dc logic level.

Monitor the signal at Pin 4 of IC20. This signal should be the same as the frequency at Pin 11 of IC13 which is gated on and off by the signal at Pin 1 of IC15. The signal at Pins 2 and 3 of IC20 should be short negative pulses with a pulse duration of approximately 2 µs.

If any one digit is not illuminated, then either the LED display or its digit driver is defective. The digit drivers are controlled by IC20 Pins 20 through 23. Under normal operation, each one of these pins is high for 25% of the time. If any segment on any one display is defective, then that display is most likely defective. If a segment is defective on all of the displays, then the segment driver is most likely defective. The segment drivers are controlled by IC20 Pins 30 through 19.

5.3.3.9 AUDIO MONITOR (42-400 BOARD)

The audio monitor amplifier consists of IC22, Q1, and Q2 on the 42-400 board. Monitor the signal at Pin 5 of IC22. If no signal is present, then IC17 or IC1 on the 42-100 board is most likely defective. If the signal is present, monitor the signal at the emitter of either Q1 and Q2. This signal should be an amplified version of the signal at Pin 5 of IC22. Some crossover distortion at this point is normal. If the signal is not present, then either IC22, Q1, or Q2 is defective. If the signal is present but no sound is heard, then the speaker is most likely defective.

5.3.3.10 RECEIVE INPUT AMPLIFIER (42-100 BOARD)

Apply an input signal of 0.0 dBm at a frequency of 1 kHz. Monitor the signal at Pin 6 of IC1. This signal should be a 1 kHz sine wave at a level of approximately 0.0 dBm. If this signal is not present, then the input termination or blocking capacitors are most likely defective.

Monitor the signal at Pin 7 of IC17. This signal should be a 1 kHz sine wave at a level of 0.0 dBm ±0.5 dB. If this signal is not present, then either IC17 is defective or the send/receive switches Q1 through Q4 are defective.

Switching the 600 Ω and 900 Ω terminations should cause a gain change of less than ±0.2 dB at Pin 7 of IC17. If this gain change does not occur properly, then S1, S2, or S3 are most likely defective.

5.3.3.11 NOTCH FILTER (42-100 BOARD)

Press the 3 KHZ filter button. Apply an input signal of 1000 Hz at a level of 0.0 dBm. Monitor the signal at Pin 6 of IC1 and Pin 7 of IC12. Verify that the signal is present at Pin 6 of IC1, but is not present

at Pin 7 of IC12. The level at Pin 7 of IC12 should drop at least 50 dB provided the total harmonic distortion of the input signal is less than 56 dB.

If the correct signals are not present at Pin 7 of IC12, perform the notch filter calibration alignment as described in Section 5.3.4.2 of this manual. If any one section of the notch filter does not align properly, then that section of the filter is most likely defective.

5.3.3.12 C-MESSAGE FILTER (42-101 BOARD)

Apply an input signal of 0.0 dBm at a frequency of 2 kHz, and monitor the signal at Pin 7 of IC9, Pins 1 and 7 of IC11. The 2 kHz signal should be present at each one of these points with a slight variation in level. If the signal is present at one point but not at the next point, then that IC is most likely defective.

5.3.3.13 3 KHZ FILTER (42-101 BOARD)

Apply an input signal of 0.0 dBrn at a frequency of 2 kHz. Monitor the signal at Pin 1 of IC8 and Pin 7 of IC12. The 2 kHz signal should be present at both of these points with the level at Pin 1 of IC8 about 0.5 dBrn below the level at Pin 7 of IC12. If the correct level is not present, then IC8 is most likely defective.

5.3.3.14 15 KHZ FILTER (42-101 BOARD)

Apply an input signal of 0.0 dBrn at a frequency of 2 kHz. Monitor the signal at Pin 7 of IC8 and Pin 7 of IC12. The 2 kHz signal should be present at both of these points at the same level, ±0.2 dB. If the correct level is not present, then IC8 is most likely defective.

5.3.3.15 PROGRAM FILTER (42-101 BOARD)

Apply an input signal of -6.0 dBm at a frequency of 4.5 kHz. Monitor the signal at Pin 7 of IC12, Pins 7 and 1 of IC7, and Pin 1 of IC6. The signal should be present at each of these points at approximately the same level. If the signal is present at one point but not the next point, then that IC is most likely defective.

5.3.3.16 AUTORANGE FILTER (42-101 BOARD)

Set the controls to monitor the receive level and apply an input signal at a frequency of 1000 Hz at a level of 0.0 dBm. Monitor this signal at Pin 6 of IC15. This signal should be the 1000 Hz sine wave at a level of 0.0 dBm ±0.5 dB. If this signal is not present, then IC15 or Q10 may be defective.

Decrease the input level to -20.0 dBm. The level at Pin 6 of IC5 and Pin 1 of IC2 should be 0.0 dBm ±0.5 dB. If this signal is not present, then IC12 or Q11 may be defective.

Decrease the input level to -40.0 dBm. Monitor the signal at Pin 6 of IC5 and Pin 1 of IC3. This signal level should be 0.0 dBm ±0.5 dB. If the signal is present at IC3 but not IC5, then Q12 is most likely defective. If the signal is not present at IC3, then IC3 is most likely defective.

Decrease the input level to -60.0 dBm. Monitor the signal at Pin 6 of IC5 and Pin 1 of IC4. This signal level should be 0.0 dBm ±0.5 dB. If the signal is not present at IC5 but is present at IC4, then Q13 is most likely defective. If the signal is not present at IC4, then IC4 is most likely defective.

5.3.3.17 DETECTORS (42-201 BOARD)

Apply an input signal of 0.0 dBm at a frequency of 2 kHz. Monitor the signal at Pins 1 and 7 of IC28. These signals should both be approximately +2 V dc. If the correct signal is present at Pin 7 of IC28 but not at Pin 1, then IC27 is most likely defective. If the correct signal is not present at either point, monitor the waveform at the anode of D1. This signal should be a negative-going half-wave rectified sine wave. If this signal is not correct, then IC26 is most likely defective. If this signal is correct, then IC28 is most likely defective.

5.3.3.18 LOG CONVERTER (42-201 BOARD)

Apply an input signal of 1000 Hz at a level of 0.0 dBm. Using Figure 5-17, monitor the waveform at the test point indicated. If the correct waveform is not present at a particular test point, then the IC pertaining to that test point is most likely defective.

5.3.3.19 DIGITAL VOLTMETER CONTROLS (42-201 BOARD)

Set the controls to monitor the receive level. Apply an input signal of 1000 Hz at a level of 0.0 dBm. Monitor the signal at the collectors of Q5 and Q6. A high signal corresponds to a voltage of +5 V. A low signal corresponds to a level of 0 V.

With an input of 0.0 dBm, both Q5 and Q6 should be low.

With a level of -20.0 dBm, Q5 should be high and Q6 should be low.

With an input level of -40.0 dBm, Q5 should be low and Q6 should be high.

With an input level of -60.0 dBm, both Q5 and Q6 should be high.

The following measurements are made on the 42-201 board:

With an input signal of 0.0 dBm, Pin 12 of IC10 should be high and Pins 3, 4, and 13 should be low.

With an input level of -20.0 dBm, Pin 13 of IC10 should be high and Pins 2, 4, and 12 should be low.

With an input level of -40.0 dBm, Pins 12 and 13 of IC10 should be high and Pins 3 and 4 should be low.

With an input level of -60.0 dBm, Pin 3 of IC10 should be high and Pins 4, 12, and 13 should be low.

5.3.3.20 DIGITAL VOLTMETER SEGMENT DRIVERS (42-201 BOARD)

Set the controls to monitor the receive level. Apply an input signal of 1000 Hz at a level of 0.0 dBm.

The information from counters IC10 through IC12 is coupled to segment drivers IC5 through IC7 in a BCD code format. If the correct segments are not illuminated, verify that the correct BCD code is present at the input to the segment driver. If the correct code is present but the

correct segment is not illuminated, then the segment is most likely defective. If the correct code is not present, then the counter corresponding to that segment driver is most likely defective.

5.3.4 CALIBRATION

The following procedures are used to recalibrate the generator and receiver circuitry. Recalibration is normally required when maintenance has been performed on associated circuitry or when there is a reason to suspect that calibration is no longer accurate.

5.3.4.1 POWER SUPPLY (42-500 BOARD)

Step A. Connect a digital dc voltmeter from the positive end of C14 to ground.

Step B. Adjust R17 for a reading of 9.00 V dc ±0.02 V dc on the digital voltmeter.

Step C. Connect the digital voltmeter from the negative end of C15 to ground.

Step D. Verify that the reading on the digital voltmeter is -9.00 V dc ±0.02 V dc. If not, readjust R17 so that both the positive and negative supply voltages are within the tolerance limits.

On units with the optional battery pack, the following additional steps are required:

Step E. Remove the batteries from the unit.

Step F. Connect the digital voltmeter from the positive end of C2 to ground.

Step G. Adjust R3 for a reading of +13.9 V dc ±0.1 V dc on the digital voltmeter.

Step H. Connect the digital voltmeter from the negative end of C5 to ground.

Step I. Adjust R7 for a reading of -13.9 V dc ±0.1 V dc on the digital voltmeter.

Step J. Reconnect the batteries to the unit.

5.3.4.2 NOTCH FILTER ALIGNMENT (42-101 BOARD)

Step A. Set the Model 42 to the C-MSG plus notch measurement mode.

Step B. Set the receive input to 600 Ω terminated.

Step C. Apply an input frequency of 1010 Hz ±1 Hz at a level of 0.0 dBm ±0.2 dBm to the Model 42 input.

Step D. Monitor the notch filter output at Pin 7 of IC17 using an ac voltmeter.

Step E. Using short clip leads, place jumper wires across capacitors C60, C62, and C65.

Step F. Adjust R114 and R136, in turn, for a null on the ac voltmeter.

Step G. Remove the jumper wire from C60 and connect it across C57.

Step H. Adjust R119 and R142 for a null on the ac voltmeter.

Step I. Remove the jumper wire from C62 and connect it across C60.

Step J. Adjust R125 and R146 for a null on the ac voltmeter.

Step K. Remove the jumper wire from C65 and connect it across C62.

Step L. Adjust R129 and R152 for a null on the ac voltmeter.
Step M. Remove the jumper wires across C57, C60 and C62.

5.3.4.3 LEVEL DETECTING CALIBRATION (42-201 BOARD)

Step A. Set the Model 42 to the receive level measurement mode.
Step B. Set the receive input to 600 Ω terminated.
Step C. Monitor the dc voltage of Pin 7 of IC28 using a digital dc voltmeter.
Step D. Set the input signal to a frequency of 100 Hz ±5 Hz at a level below -12.0 dBm and then increase to -10.00 dBm ±0.05 dBm.
Step E. Adjust R14 on the 42-101 board for a reading of 6.000 V dc ±0.006 V dc on the dc voltmeter.
Step F. Set the input level above -8.0 dBm and then decrease to -10.00 dBm ±0.05 dBm.
Step G. Adjust R6 for a reading of 0.600 V dc ±0.002 V dc on the dc voltmeter.
Step H. Repeat Steps D through G until no further adjustment is required.

5.3.4.4 LOG CONVERTER CALIBRATION (42-201 BOARD)

Step A. Set the Model 42 to the receive level measurement mode.
Step B. Set the receiver input to 600 Ω terminated.
Step C. Set the input signal to 1000 Hz ±5 Hz at a level of below -20.0 dBm and then increase to -10.0 dBm ±0.05 dBm.
Step D. Adjust R27 for a reading of -10.0 dBm on the Model 42.
Step E. Set the input signal level above -8.0 dBm and then decrease to -10.00 dBm ±0.05 dBm.
Step F. Adjust R32 for a reading of -10.0 dBm on the Model 42.
Step G. Repeat Steps C through F until no further adjustment is required.

5.3.4.5 NOISE DETECTING CALIBRATION (42-201 BOARD)

Step A. Set the Model 42 to the 15 kHz plus notch measurement mode.
Step B. Set the receiver input to 600 Ω terminated.
Step C. Monitor the dc voltage at Pin 1 of IC28 using a digital dc voltmeter.
Step D. Set the input signal to a frequency of 2000 Hz ±10 Hz at a level below -20.0 dBm and then increase to -10.00 dBm ±0.05 dBm.
Step E. Adjust R110 on the 42-101 board for a reading of 6.356 V dc ±0.012 V dc on the digital voltmeter.
Step F. Set the input level above -8.0 dBm and then decrease to -10.00 ±0.05 dBm.
Step G. Adjust R21 for a reading of 0.6356 V dc ±0.0020 V dc on the digital voltmeter.
Step H. Repeat Steps D through G until no further adjustment is required.

5.3.4.6 FILTER LEVEL ADJUSTMENTS (42-201 BOARD)

Step A. Perform procedures listed in Section 5.3.4.5.
Step B. Press the 42-101 board switch labeled C-MSG.
Step C. Set the input level below -12.0 dBm and then increase to -10.00 dBm ±0.05 dBm.
Step D. Adjust R100 on the 42-101 board for a reading of 5.472 V dc ±0.006 V dc on the digital voltmeter.
Step E. Press the 42-101 board switch labeled PROG.
Step F. Set the input signal to a frequency of 4000 Hz ±20 Hz at a level of -18.00 dBm ±0.05 dBm.
Step G. Adjust R70 on the 42-101 board for a reading of 5.347 V dc ± 0.006 V dc on the digital voltmeter.

5.3.4.7 LOW FREQUENCY SET (42-404 BOARD)

Step A. Set the generator to the continuous mode.
Step B. Monitor the output signal at the output terminal using an ac voltmeter and frequency counter.
Step C. Set the LEVEL control for an output of -10.0 dBm ±0.2 dBm.
Step D. Set the FREQUENCY control on the Model 42 to the fully counterclockwise position.
Step E. Adjust R97 for an output frequency of 175 Hz ±2 Hz. (On units with the 40 Hz to 20 kHz option, adjust R97 for 35 Hz ±1 Hz.)

5.3.4.8 SIGNAL PURITY ADJUSTMENT (42-404 BOARD)

Step A. Set the FREQUENCY control on the Model 42 for an output of 1010 Hz ±10 Hz.
Step B. Set the send level to 0.0 dBm ±0.2 dBm.
Step C. Connect the Model 42 send output to a 1010 Hz notch filter. Monitor the notch filter output on an ac voltmeter.
Step D. Adjust R67 and R74, in turn, for a minimum reading on the ac voltmeter.

5.3.4.9 FIXED FREQUENCY ADJUSTMENT (42-404 BOARD)

Step A. Press the fixed frequency pushbutton to the left of the 1004 Hz switch.
Step B. Short together Terminals N and P of the 42-301-101 board and adjust R115 for the correct output frequency ±3 Hz.
Step C. Press the fixed frequency pushbutton to the right of the 1004 Hz switch.
Step D. Short together Terminals N and P of the 42-301-101 board and adjust R118 for the correct output frequency ±5 Hz.

5.3.4.10 SEND LEVEL CALIBRATION (42-404 BOARD)

Step A. Press the 42-404 board switches labeled CONT, VAR, and 600 Ω.
Step B. Connect a load resistor of 600.0 Ω ±0.6 Ω to the send output jack.
Step C. Connect a digital ac voltmeter across the 600 Ω load resistor.

Step D. Vary the FREQUENCY and LEVEL controls for an output frequency of 1004 Hz ±5 Hz at a level of 0.7746 V ac ±0.0025 V ac as read on the digital ac voltmeter.

Step E. Set the Model 42 to measure SEND LEVEL and adjust R107 on the 42-301-101 board for a reading of ±0.0 dBm on the Model 42.

Step F. Press the 42-404 board switch labeled 1.004.

Step G. Adjust R21 for a reading of 0.7746 V ac ±0.0025 V ac on the digital ac voltmeter.

Step H. Press the 42-400 board fixed level switch.

Step I. Adjust R127 for the correct fixed output level as read on the Model 42.

Table 5-2 MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C1	Capacitor, Disk, .0047 µfd		
	C2	Capacitor, Tantalum Electrolytic, 22 µfd, 15 V	CS13	
	C3	Capacitor, Dipped Mica, 150 pf, 500 V	DM15	
	C4	Capacitor, Tantalum Electrolytic, 22 µfd, 15 V	CS13	
	C5	Capacitor, Tantalum Electrolytic, 22 µfd, 15 V	CS13	
	C6	Capacitor, Tantalum Electrolytic, 22 µfd, 15 V	CS13	
	C7	Capacitor, Disk, 10 pf		
	C8	Capacitor, Disk, .01 µfd, 50 V		
	C9	Capacitor, 22 µfd, 15 V	CS13	
	C10	Capacitor, Disk, .01 µfd, 50 V		
	C11	Capacitor, Disk, .01 µfd, 50 V		
	C12	Capacitor, Tantalum Electrolytic, 2.2 µfd, 15 V	CS13	
	C13	Capacitor, Tantalum Electrolytic, 2.2 µfd, 15 V	CS13	
	C14	Capacitor, Tantalum Electrolytic, 2.2 µfd, 15 V	CS13	
	C15	Capacitor, Disk, .01 µfd, 50 V		
	C16	Capacitor, Disk, .01 µfd, 50 V		
	C17	Capacitor, Tantalum Electrolytic, 2.2 µfd, 15 V	CS13	
	C18	Capacitor, Tantalum Electrolytic, 2.2 µfd, 15 V	CS13	
	C19	Capacitor, Tantalum Electrolytic, 2.2 µfd, 15 V	CS13	
	C20	Capacitor, Disk, .01 µfd, 50 V		
	C21	Capacitor, Polystyrene .01 µfd, 1%	611	Mial
	C22	Capacitor, Polystyrene, 5000 pf, 1%	611	Mial
	C23	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C24	Capacitor, Polystyrene, 5000 pf, 1%	611	Mial
	C25	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial

Table 5-2 MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C26	Capacitor, Polystyrene, .015 µfd, 1%	611	Mial
	C27	Capacitor, Polystyrene, 4700 pf, 1%	611	Mial
	C28	Capacitor, Polystyrene, 1500 pf, 1%	611	Mial
	C29	Capacitor, Polystyrene, 7500 pf, 1%	611	Mial
	C30	Capacitor, Polystyrene, 1000 pf, 1%	611	Mial
	C31	Capacitor, Polysytrene, .015 µpf, 1%	611	Mial
	C32	Capacitor, Polystyrene, 270 pf, 1%	611	Mial
	C33	Capacitor, Polycarbonate, .47 µfd, 100 V	B32541	Siemens
	C34	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C35	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C36	Capacitor, Polystyrene, .015 µfd, 1%	611	Mial
	C37	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C38	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C39	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C40	Capacitor, Polystyrene, .027 µfd, 1%	611	Mial
	C41	Capacitor, Polystyrene, 220 µfd, 1%	611	Mial
	C42	Capacitor, Polystyrene, .013 µfd, 1%	611	Mial
	C43	Capacitor, Polystyrene, 4700 pf, 1%	611	Mial
	C44	Capacitor, Polystyrene, 3900 pf, 1%	611	Mial
	C45	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C46	Capacitor, Aluminum electrolytic, 75 µfd, 100 V	39D756F 100 FJ4	Sprague
	C47	Capacitor, Selected		
	C48	Not used		
	C49	Not used		
	C50	Capacitor, Aluminum electrolytic, 75 µfd, 100 V	39D756F 100 FJ4	Sprague

Table 5-2 MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C51	Capacitor, Dipped Mica, 43 pf	DM15	
	C52	Capacitor, Selected		
	C53	Capacitor, Selected		
	C54	Capacitor, Polycarbonate, .22 µfd, 250 V	B32541	Siemens
	C55	Capacitor, Selected		
	C56	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C57	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C58	Capacitor, Selected		
	C59	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C60	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C61	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C62	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C63	Capacitor, Selected		
	C64	Capacitor, Polystyrene, .01 µfd, 1%	611	Mial
	C65	Capaictor, Polystyrene, .01 µfd, 1%	611	Mial
	C66	Capacitor, Tantallum electrolytic, 22 µfd, 15 V	CS13	
	C67	Capacitor, Tantalum electrolytic, 22 µfd, 15 V	CS13	
	C68	Capacitor, Disk, .1 µfd		
	C69	Capacitor, Disk, .1 µfd		
	C70	Capacitor, Disk, .1 µfd		
	C71	Capacitor, Disk, .1 µfd		
	C72	Capacitor, Disk, .1 µfd		
	C73	Capacitor, Disk, .1 µfd		
	C74	Capacitor, Disk, .1 µfd		
	C75	Capacitor, Disk, .1 µfd		

Table 5-2 MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C76	Capacitor, Disk, .1 µfd		
	C77	Capacitor, Disk, .1 µfd		
	C78	Capacitor, Disk, .1 µfd		
	C79	Capacitor, Disk, .1 µfd		
	C80	Capacitor, Disk, .1 µfd		
	C81	Capacitor, Disk, .1 µfd		
	C82	Capacitor, Disk, .1 µfd		
	C83	Capacitor, Disk, .1 µfd		
	C84	Capacitor, Disk, .1 µfd		
	C85	Capacitor, Disk, .1 µfd		
	C86	Capacitor, Disk, .1 µfd		
	C87	Capacitor, Disk, .1 µfd		
	C88	Capacitor, Polycarbonate, 2.2 µfd, 100 V	34421225	Mepco
	C89	Capacitor, Polystyrene, 5000 pf, 1%	611	Mial
	C90	Capacitor, Dipped Mica, 430 pf	DM15	
	C91	Capacitor, Dipped Mica, 62 pf	DM15	
	C92	Capacitor, Polystyrene, 1100 pf	611	Mial
	C93	Capacitor, Disk, .1 µfd		
	C94	Capacitor, Disk, .1 µfd		
	C95	Capacitor, Disk, .1 µfd		
	C96	Capacitor, Disk, .1 µfd		
	C97	Capacitor, Disk, .1 µfd		
	C98	Capacitor, Disk, .1 µfd		
	C99	Capacitor, Disk, .1 µfd		
	C100	Capacitor, Disk, .1 µfd		

Table 5-2 MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C101	Capacitor, Disk, .1 µfd		
	C102	Capacitor, Disk, .1 µfd		
	C103	Capacitor, Disk, .1 µfd		
	C104	Capacitor, Disk, .1 µfd		
	C105	Capacitor, Disk, .1 µfd		
	C106	Capacitor, Disk, .1 µfd		
	C107	Capacitor, Polycarbonate, .47 µfd, 100 V	B32541	Siemens
	C108	Capacitor, Selected		
	C109	Not Used		
	C110	Capacitor, Disk, .1 µfd, 10 V		
	C111	Capacitor, Disk, .0039 µfd		
	D1	Diode, Silicon	1N4454	
	D2	Diode, Silicon	1N4454	
	D3	Diode, Silicon	1N4454	
	D4	Diode, Silicon	1N4454	
	D5	Diode, Silicon	1N4454	
	D6	Diode, Silicon	1N4454	
	D7	Diode, Silicon	1N4454	
	D8	Diode, Silicon	1N4454	
	D9	Diode, Silicon	1N4454	
	D10	Diode, Silicon	1N4454	
	D11	Diode, Silicon	1N4454	
	D12	Diode, Silicon	1N4454	
	D13	Diode, Silicon	1N4454	

Table 5-2

MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	D14	Diode, Silicon	1N4454	
	D15	Diode, Silicon	1N4454	
	D16	Not Used		
	D17	Diode, Silicon	1N4454	
	D18	Diode, Silicon	1N4454	
	D19	Diode, Silicon	1N4454	
	D20	Diode, Silicon	1N4454	
	IC1	Integrated Circuit, Op/Amp	LF356H	National
	IC2	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC3	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC4	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC5	Integrated Circuit, Op/Amp	LF356H	National
	IC6	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC7	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC8	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC9	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC10	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC11	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC12	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC13	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC14	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC15	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC16	Integrated Circuit, Dual Op/Amp	RC4558P	TI

Table 5-2 MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	IC17	Integrated Circuit, Dual Op/Amp	RC4558P	TI
	IC18	Integrated Circuit, Op/Amp	LF356H	National
	J1	Connector, 18 Pin	583773-8	Amp, Inc.
	Q1	Transistor, FET	2N5639	
	Q2	Transistor, FET	2N5639	
	Q3	Transistor, FET	2N5639	
	Q4	Transistor, FET	2N5639	
	Q5	Transistor, Silicon	2N4401	
	Q6	Transistor, Silicon	2N4401	
	Q7	Transistor, Silicon	2N5138	
	Q8	Transistor, Silicon	2N5138	
	Q9	Transistor, Silicon	2N5138	
	Q10	Transistor, FET	2N5639	
	Q11	Transistor, FET	2N5639	
	Q12	Transistor, FET	2N5639	
	Q13	Transistor, FET	2N5639	
	R1	Resistor, Fixed, 10.0 kΩ, 1%	RN55D	A-B.
	R2	Resistor, Fixed, 10.00 kΩ, .1%	RN55C	ACI
	R3	Resistor, Fixed, 10.00 kΩ, .1%	RN55C	ACI
	R4	Resistor, Fixed, 1 MΩ, 5%	RCR07	AB
	R5	Not Used		

Table 5-2

MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R6	Resistor, Fixed, 10.00 kΩ, .1%	RN55C	ACI
	R7	Resistor, Fixed, 100.0 kΩ, .1%	RN55C	ACI
	R8	Resistor, Fixed, 10.00 kΩ, .1%	RN55C	ACI
	R9Re	Resistor, Fixed, 100.0 kΩ, .1%	RN55C	ACI
	R10	Resistor, Fixed, 10.00 kΩ, .1%	RN55C	ACI
	R11	Resistor, Fixed, 100.0 kΩ, .1%	RN55C	ACI
	R12	Resistor, Fixed, 10.00 kΩ, .1%	RN55C	ACI
	R13	Resistor, Fixed, 9.53 kΩ, 1%	RN55D	AB
	R14	Resistor, Variable, 1 kΩ, 10%	72PMR1K	Beckman
	R15	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R16	Resistor, Fixed, 1MΩ , 5%	RCR07	AB
	R17	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R18	Resistor, Fixed, 1MΩ, 5%	RCR07	AB
	R19	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R20	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R21	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R22	Resistor, Fixed, 10.00 kΩ, .1%	RN55C	ACI
	R23	Resistor, Fixed, 1 MΩ, 5%	RCR07	AB
	R24	Resistor, Fixed, 1 MΩ, 5%	RCR07	AB
	R25	Resistor, Fixed, 1 MΩ, 5%	RCR07	AB
	R26	Resistor, Fixed, 100 kΩ, 1%	RN55D	AB
	R27	Resistor, Fixed, 100 kΩ, 1%	RN55D	AB
	R28	Resistor, Fixed, 100 kΩ, 1%	RN55D	AB
	R29	Resistor, Fixed, 100 kΩ, 1%	RN55D	AB

Table 5-2 MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R30	Resistor, Fixed, 10.00 kΩ,.1%	RN55C	ACI
	R31	Resistor, Fixed, 1 MΩ, 5%	RCR07	AB
	R32	Resistor, Fixed, 3.83 kΩ, 1%	RN55D	AB
	R33	Resistor, Fixed, 100 kΩ, 1%	RN55D	AB
	R34	Resistor, Fixed, 3.83 kΩ, 1%	RN55D	AB
	R35	Resistor, Fixed, 3.83 kΩ, 1%	RN55D	AB
	R36	Resistor, Fixed, 100 kΩ, 1%	RN55D	AB
	R37	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R38	Resistor, Fixed, 17.8 kΩ, 1%	RN55D	AB
	R39	Resistor, Fixed, 20 kΩ, 5%	RCR07	AB
	R40	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R41	Resistor, Fixed, 20 kΩ, 5%	RCR07	AB
	R42	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R43	Resistor, Fixed, 20 kΩ, 5%	RCR07	AB
	R44	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R45	Resistor, Fixed, 20 kΩ, 5%	RCR07	AB
	R46	Resistor, Fixed, 1 MΩ, 5%	RCR07	AB
	R47	Resistor, Fixed, 7.50 kΩ, 1%	RN55D	AB
	R48	Resistor, Fixed, 7.50 kΩ, 1%	RN55D	AB
	R49	Resistor, Fixed, 30 kΩ, 5%	RCR07	AB
	R50	Resistor, Fixed, 30 kΩ, 5%	RCR07	AB
	R51	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R52	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R53	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R54	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB

Table 5-2

MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R55	Resistor, Fixed, 12.59 kΩ, .1%	RN55C	ACI
	R56	Resistor, Fixed, 1.5 kΩ, 1%	RN55D	AB
	R57	Resistor, Fixed, 1.5 kΩ, 1%	RN55D	AB
	R58	Resistor, Fixed, 11.0 kΩ, 1%	RN55D	AB
	R59	Resistor, Fixed, 11.0 kΩ, 1%	RN55D	AB
	R60	Resistor, Fixed, 24.9 kΩ, 1%	RN55D	AB
	R61	Resistor, Fixed, 21.5 kΩ, 1%	RN55D	AB
	R62	Resistor, Fixed. 10.0 kΩ, 1%	RN55D	AB
	R63	Not Used		
	R64	Not Used		
	R65	Resistor, Fixed, 8.25 kΩ, 1%	RN55D	AB
	R66	Resistor, Fixed, 8.25 kΩ, 1%	RN55D	AB
	R67	Resistor, Fixed, 8.25 kΩ, 1%	RN55D	AB
	R68	Resistor, Fixed, 10.0 kΩ, 1%	RN55D	AB
	R69	Resistor, Fixed, 10.0 kΩ, 1%	RN55D	AB
	R70	Resistor, Variable, 5 kΩ, 10%	72PMR5K	Beckman
	R71	Resistor, Fixed, 5.11 kΩ, 1%	RN55D	AB
	R72	Resistor, Fixed, 62.52 kΩ, .1%	RN55C	ACI
	R73	Resistor, Fixed, 6.033 kΩ, .1%	RN55C	ACI
	R74	Resistor, Fixed, 10.00 kΩ, .1%	RN55C	ACI
	R75	Resistor, Fixed, 2.589 kΩ, .1%	RN55C	ACI
	R76	Resistor, Fixed, 312.8 Ω, .1%	RN55C	ACI
	R77	Not Used		
	R78	Not Used		
	R79	Not Used		

Table 5-2 MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R80	Not Used		
	R81	Not Used		
	R82	Not Used		
	R83	Not Used		
	R84	Resistor, Fixed, 7.68 kΩ, 1%	RN55D	AB
	R85	Resistor, Fixed, 39.2 kΩ, 1%	RN55D	AB
	R86	Resistor, Fixed, 13.7 kΩ, 1%	RN55D	AB
	R87	Resistor, Fixed, 4.99 kΩ, 1%	RN55D	AB
	R88	Not Used		
	R89	Resistor, Fixed, 4.99 kΩ, 1%	RN55D	AB
	R90	Resistor, Fixed, 4.99 kΩ, 1%	RN55D	AB
	R91	Resistor, Fixed, 60.4 kΩ, 1%	RN55D	AB
	R92	Resistor, Fixed, 3.83 kΩ, 1%	RN55D	AB
	R93	Resistor, Variable, 2 kΩ, 1%	72PMR2K	Beckman
	R94	Resistor, Fixed, 7.87 kΩ, 1%	RN55D	AB
	R95	Resistor, Fixed, 7.87 kΩ, 1%	RN55D	AB
	R96	Resistor, Fixed, 32.4 kΩ, 1%	RN55D	AB
	R97	Resistor, Fixed, 32.4 kΩ, 1%	RN55D	AB
	R98	Resistor, Fixed, 32.4 kΩ, 1%	RN55D	AB
	R99	Resistor, Fixed, 10.5 kΩ, 1%	RN55D	AB
	R100	Resistor, Variable, 5 kΩ, 1%	72PMR5K	Beckman
	R101	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R102	Resistor, Fixed, 200 Ω, 1%	RN55D	AB
	R103	Resistor, Fixed, 931 Ω, 1%	RN55D	AB

Table 5-2

MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R104	Resistor, Fixed, 619Ω , 1%	RN55D	AB
	R105	Resistor, Fixed, 10.00 kΩ, .1%	RN55C	ACI
	R106	Resistor, Fixed, 17.4 kΩ, 1%	RN55D	AB
	R107	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R108	Resistor, Fixed, 301 kΩ, 1%	RN55D	AB
	R109	Resistor, Fixed, 10.00 kΩ, .1%	RN55C	ACI
	R110	Resistor, Variable, 5 kΩ, 10%	72PMR5K	Beckman
	R111	Resistor, Fixed, 7.15 kΩ, 1%	RN55D	AB
	R112	Resistor, Fixed, 9.53 kΩ, 1%	RN55D	AB
	R113	Resistor, Fixed, 604 kΩ, 1%	RN55D	AB
	R114	Resistor, Variable, 1 kΩ, 10%	89PR1K	Beckman
	R115	Resistor, Fixed, 2.87 kΩ, 1%	RN55D	AB
	R116	Resistor, Fixed, 2.87 kΩ, 1%	RN55D	AB
	R117	Resistor, Fixed, 13.7 kΩ, 1%	RN55D	AB
	R118	Resistor, Fixed, 5.36 kΩ, 1%	RN55D	AB
	R119	Resistor, Variable, 1 kΩ, 10%	89PR1K	Beckman
	R120	Resistor, Fixed, 3.65 kΩ, 1%	RN55D	AB
	R121	Resistor, Fixed, 10.2 kΩ, 1%	RN55D	AB
	R122	Resistor, Fixed, 1.54 kΩ, 1%	RN55D	AB
	R123	Resistor, Fixed, 14.3 kΩ, 1%	RN55D	AB
	R124	Resistor, Fixed, 5.36 kΩ, 1%	RN55D	AB
	R125	Resistor, Variable, 1 kΩ, 10%	89PR1K	Beckman
	R126	Resistor, Fixed, 4.87 kΩ, 1%	RN55D	AB
	R127	Resistor, Fixed, 3.65 kΩ, 1%	RN55D	AB
	R128	Resistor, Fixed, 5.76 kΩ, 1%	RN55D	AB

Table 5-2 MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R129	Resistor, Variable, 1 kΩ, 10%	89PR1K	Beckman
	R130	Resistor, Fixed, 3.24 kΩ, 1%	RN55D	AB
	R131	Resistor, Fixed, 4.32 kΩ, 1%	RN55D	AB
	R132	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R133	Resistor, Fixed, 118 kΩ, 1%	RN55D	AB
	R134	Resistor, Fixed, 15.8 kΩ, 1%	RN55D	AB
	R135	Resistor, Fixed, 14.7 kΩ, 1%	RN55D	AB
	R136	Resistor, Variable, 2 kΩ, 10%	72PMR2K	Beckman
	R137	Resistor, Fixed, 2.94 kΩ, 1%	RN55D	AB
	R138	Resistor, Fixed, 1.87 kΩ, 1%	RN55D	AB
	R139	Resistor, Fixed, 8.66 kΩ, 1%	RN55D	AB
	R140	Resistor, Fixed, 15.8 kΩ, 1%	RN55D	AB
	R141	Resistor, Fixed, 14.7 kΩ, 1%	RN55D	AB
	R142	Resistor, Variable, 2 kΩ, 10%	72PMR2K	Beckman
	R143R	Resistor, Fixed, 866 kΩ, 1%	RN55D	AB
	R144	Resistor, Fixed, 15.8 kΩ, 1%	RN55D	AB
	R145	Resistor, Fixed, 14.7 kΩ, 1%	RN55D	AB
	R146	Resistor, Variable, 2 kΩ, 10%	72PMR2K	Beckman
	R147	Resistor, Fixed, 3.01 kΩ, 1%	RN55D	AB
	R148	Resistor, Fixed, 1 kΩ, 1%	RN55D	AB
	R149	Resistor, Fixed, 24.3 kΩ, 1%	RN55D	AB
	R150	Resistor, Fixed, 15.8 kΩ, 1%	RN55D	AB
	R151	Resistor, Fixed, 14.7 kΩ, 1%	RN55D	AB
	R152	Resistor, Variable, 2 kΩ, 10%	72PMR2K	Beckman

Table 5-2 MODEL 42-100 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R153	Resistor, Fixed, 11.3 kΩ, 1%	RN55D	AB
	R154	Resistor, Fixed, 11.3 kΩ, 1%	RN55D	AB
	R155	Resistor, Fixed, 11.3 kΩ, 1%	RN55D	AB
	R156	Resistor, Fixed, 1.2 kΩ, 5%	RCR07	AB
	SI-510	Switch, Pushbutton	TS1-770224-B2	Shadow
	T1	Transformer, Input	TM3186	HLI

Table 5-3 MODEL 42-200 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C1	Capacitor, Tantalum Electrolytic, 6.8 µfd, 15 V, 10%	CS13	
	C2	Not Used		
	C2	Not Used		
	C3	Not Used		
	C4	Not Used		
	C5	Capacitor, Tantalum Electrolytic, 22 µfd, 15 V, 10%	CS13	
	C6	Capacitor, Tantalum Electrolytic, 6.8 µfd, 15 V, 10%	CS13	
	C7	Capacitor, Disk, .1 µfd		
	C8	Capacitor, Disk, 30 pf		
	C9	Capacitor, Disk, .1 µfd		
	C10	Capacitor, Polystyrene, .047 µfd, 63 V, 1%	611	Mial
	C11	Capacitor, Disk, .1 µfd		
	C12	Capacitor, Tantalum Electrolytic, 22 µfd, 15 V, 10%	CS13	
	C13	Capacitor, Tantalum Electrolytic, 22 µfd, 15 V, 10%	CS13	
	C14	Capacitor, Tantalum Elec-rolytic, 22 µfd, 15 V, 10%	CS13	
	C15	Capacitor, Disk, ,01 µfd		
	C16	Capacitor, Disk, 30 pf		
	C17	Capacitor, Disk, .01 µfd, 50 V		
	C18	Capacitor, Disk, .01 µfd, 50 V		
	C19	Capacitor, Disk, .01 µfd, 50 V		
	C20	Capacitor, Disk, .01 µfd, 50 V		
	C21	Capacitor, Disk, .01 µfd, 50 V		
	C22	Capacitor, Disk, .01 µfd, 50 V		
	C23	Capacitor, Disk, .01 µfd, 50 V		

Table 5-3 MODEL 42-200 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C24	Capacitor, Disk, .01 µfd, 50 V		
	C25	Capacitor, Disk, .01 µfd, 50 V		
	C26	Capacitor, Disk, .01 µfd, 50 V		
	C27	Capacitor, Disk, .01 µfd, 50 V		
	C28	Capacitor, Disk, .01 µfd, 50 V		
	C29	Capacitor, Disk, .01 µfd, 50 V		
	C30	Capacitor, Disk, .01 µfd, 50 V		
	C31	Capacitor, Disk, .01 µfd, 50 V		
	C32	Capacitor, Disk, .01 µfd, 50 V		
	C33	Capacitor, Disk, .01 µfd, 50 V		
	C34	Capacitor, Disk, .01 µfd, 50 V		
	C35	Capacitor, Disk, .01 µfd, 50 V		
	C36	Capacitor, Disk, .01 µfd, 50 V		
	C37	Capacitor, Disk, .01 µfd, 50 V		
	C38	Capacitor, Disk, .1 µfd, 50 V		
	C39	Capacitor, Disk, .1 µfd, 50 V		
	C40	Capacitor, Disk, .1 µfd, 50 V		
	C41	Capacitor, Disk, .1 µfd, 50 V		
	C42	Capacitor, Disk, .01 µfd, 50 V		
	C43	Capacitor, Disk, .01 µfd, 50 V		
	C44	Capacitor, Disk, .01 µfd, 50 V		
	C45	Capacitor, Disk, .01 µfd, 50 V		
	D1	Diode, Silicon	1N4454	

Table 5-3 MODEL 42-200 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	D2	Diode, Silicon	1N4454	
	D3	Diode, Silicon	1N4454	
	D4	Diode, Silicon	1N4454	
	D5	Diode, Zener	1N823A	
	D6	Diode, Zener	1N5729B	
	D7	Diode, Silicon	1N4454	
	D8	Diode, Silicon	1N4454	
	D9	Diode, Silicon	1N4454	
	D10	Diode, Silicon	1N4454	
	D11	Diode, Silicon	1N4454	
	D12	Diode, Silicon	1N4454	
	D13	Diode, Silicon	1N4454	
	D14	Diode, Silicon	1N4454	
	FC1	Flat Cable, 18 Pin	1-86945-7	AMP, Inc.
	IC1	Integrated Circuit, Digital, CMOS	CD4069BFX	RCA
	IC2	Integrated Circuit, Digital, CMOS	CD4013BFX	RCA
	IC3	Integrated Circuit, Digital, CMOS	CD4011BFX	RCA
	IC4	Integrated Circuit, Digital, CMOS	CD4002BFX	RCA
	IC5	Integrated Circuit, Digital, CMOS	CD4511BFX	RCA
	IC6	Integrated Circuit, Digital, CMOS	CD4511BFX	RCA
	IC7	Integrated Circuit, Digital, CMOS	CD4511BFX	RCA
	IC8	Integrated Circuit, Digital, CMOS	CD4011BFX	RCA

Table 5-3 MODEL 42-200 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	IC9	Integrated Circuit, Digital CMOS	CD4510BFX	RCA
	IC10	Integrated Circuit, Digital, CMOS	CD4510BFX	RCA
	IC11	Integrated Circuit, Digital, CMOS	CD4510BFX	RCA
	IC12	Integrated Circuit, Digital, CMOS	CD4510BFX	RCA
	IC13	Integrated Circuit, Digital, CMOS	CD4013BFX	RCA
	IC14	Integrated Circuit, Digital, CMOS	MC14070BALD	Motorola
	IC15	Integrated Circuit, Digital, CMOS	CD4001BFX	RCA
	IC16	Integrated Circuit, Digital, CMOS	CD4069BFX	RCA
	IC17	Integrated Circuit, Digital, CMOS	CD4011BFX	RCA
	IC18	Integrated Circuit, Digital, CMOS	CD4013BFX	RCA
	IC19	Integrated Circuit, Digital, CMOS	CD4023BFX	RCA
	IC20	Integrated Circuit, Digital, CMOS	CD4520BFX	RCA
	IC21	Integrated Circuit, Digital, CMOS	MC14501BALD	Motorola
	IC22	Integrated Circuit, Digital, CMOS	CD4013BFX	RCA
	IC23	Integrated Circuit, Digital, CMOS	CD4001BFX	RCA
	IC24	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	IC25	Not Used		
	IC26	Integrated Circuit, Op/Amp	LF356H	National
	IC27	Integrated Circuit, Op/Amp	LF356H	National
	IC28	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	IC29	Integrated Circuit, Digital, CMOS	CD4066BFX	RCA
	IC30	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	IC31	Integrated Circuit, Digital, CMOS	CD4066BFX	RCA
	IC32	Integrated Circuit, Op/Amp	LF356H	National

Table 5-3 MODEL 42-200 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R1	Resistor, Fixed, 20 kΩ, 1%	RN55D	AB
	R2	Resistor, Fixed, 2.43 kΩ, 1%	RN55D	AB
	R3	Resistor, Fixed, 54.9 kΩ, 1%	RN55D	AB
	R4	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R5	Resistor, Fixed, 150 kΩ, 1%	RN55D	AB
	R6	Resistor, Variable, 100 kΩ, 10%	72PMR100K	Beckman
	R7	Resistor, Fixed, 301 Ω, 1%	RN55D	AB
	R8	Resistor, Fixed, 6.2 MΩ, 5%	RCR07	AB
	R9	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R10	Resistor, Fixed, 30 kΩ, 5%	RCR07	AB
	R11	Resistor, Fixed, 20 kΩ, 1%	RN55D	AB
	R12	Resistor, Fixed, 20 kΩ, 1%	RN55D	AB
	R13	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R14	Resistor, Fixed, 20 kΩ, 1%	RN55D	AB
	R15	Resistor, Fixed, 5.11 kΩ, 1%	RN55D	AB
	R16	Resistor, Fixed, 2.43 kΩ, 1%	RN55D	AB
	R17	Resistor, Fixed, 20 kΩ, 1%	RN55D	AB
	R18	Resistor, Fixed, 30.1 kΩ, 1%	RN55D	AB
	R19	Resistor, Fixed, 20 kΩ, 1%	RN55D	AB
	R20	Resistor, Fixed, 30.1 kΩ, 1%	RN55D	AB
	R21	Resistor, Variable, 100 kΩ, 10%	72PMR100K	Beckman
	R22	Resistor, Fixed, 301 Ω, 1%	RN55D	AB
	R23	Resistor, Fixed, 30.1 kΩ, 1%	RN55D	AB
	R24	Resistor, Fixed, 30.1 kΩ, 1%	RN55D	AB
	R25	Resistor, Fixed, 30.1 kΩ, 1%	RN55D	AB

Table 5-3

MODEL 42-200 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R26	Resistor, Fixed, 78.7 kΩ, 1%	RN55D	AB
	R27	Resistor, Variable, 1 kΩ, 10%	72PMR1K	Beckman
	R28	Resistor, Fixed, 2.00 kΩ, 1%	RN55D	AB
	R29	Resistor, Fixed, 374 Ω, 1%	RN55D	AB
	R30	Resistor, Fixed, 10 MΩ, 5%	RCR07	AB
	R31	Resistor, Fixed, 174 kΩ, 1%	RN55D	AB
	R32	Resistor, Variable, 20 kΩ, 10%	72PMR20K	Beckman
	R33	Resistor, Fixed, 20 kΩ, 5%	RCR07	AB
	R34	Resistor, Fixed, 20 kΩ, 5%	RCR07	AB
	R35	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R36	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R37	Resistor, Fixed, 261 Ω, 1%	RN55D	AB
	R38	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R39	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R40	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R41	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R42	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R43	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R44	Resistor, Fixed, 30 kΩ, 5%	RCR07	AB
	R45	Resistor, Fixed, 33 kΩ, 5%	RCR07	AB
	R46	Resistor, Fixed, 7.15 kΩ, 1%	RN55D	AB
	R47	Resistor, Fixed 100 kΩ, 1%	RN55D	AB
	R48	Resistor, Fixed, 3.01 kΩ, 1%	RN55D	AB
	R49	Resistor, Fixed, 137 kΩ, 1%	RN55D	AB

Table 5-3 MODEL 42-200 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R51	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R51	Resistor, Fixed, 34.8 kΩ, 1%	RN55D	AB
	R53	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R54	Resistor, Fixed, 1 kΩ, 1%	RN55D	AB
	R55	Resistor, Fixed, 511 kΩ, 1%	RN55D	AB
	R56	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R57	Resistor, Fixed, 100 kΩ, 1%	RN55D	AB
	R58	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R59	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R60	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R61	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R62	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R63	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R64	Resistor, Fixed, 130 Ω, 5%	RCR07	AB
	R65	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R66	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R67	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R68	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R69	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R70	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R71	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R72	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R73	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R74	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R75	Resistor, Fixed, 270 Ω, 5%	RCR07	AB

Table 5-3 MODEL 42-200 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R76	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R77	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R78	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R79	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R80	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R81	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R82	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R83	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R84	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R85	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R86	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R87	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R88	Resistor, Fixed, 270 Ω, 5%	RCR07	AB
	R89	Resistor, Fixed, 10 Ω, 5%	RCR07	AB
	R90	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R91	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R92	Resistor, Fixed, 30 kΩ, 5%	RCR07	AB
	Q1	Transistor, Silicon	2N4401	
	Q2	Transistor, Silicon	2N4401	
	Q3	Transistor, Silicon	2N4401	
	Q4	Transistor, Silicon	2N4401	
	Q5	Transistor, Silicon	2N4401	

Table 5-4 MODEL 42-201-101 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	DS1	Display, LED	4630E	Monsanto
	DS2-DS4	Display, LED	4640E	Monsanto
	J1a, J1b	Connector, 14 Pin	WT-S-14-R	RN
	SO1-SO4	Socket, 14 Pin DIP	C931402	TI

Table 5-5 MODEL 42-300 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C1	Capacitor, Tantalum electrolytic, 22 μfd, 15 V, 10%	CS13	
	C2	Not Used		
	C3	Capacitor, Tantalum electrolytic, 22 μfd, 15 V, 10%	CS13	
	C4	Capacitor, Tantalum electrolytic, 22 μfd, 15 V, 10%	CS13	
	C5	Capacitor, Tantalum electrolytic, 22 μfd, 15 V, 10%	CS13	
	C6	Capacitor, Tantalum electrolytic, 22 μfd, 15 V, 10%	CS13	
	C7	Capacitor, Tantalum electrolytic, 22 μfd, 15 V, 10%	CS13	
	C8	Capacitor, .47 μfd, 100 V, 5%	B32541	Siemens
	C9	Capacitor, .47 μfd, 100 V, 5%	B32541	Siemens
	C10	Capacitor, Dipped Mica, 200 pf	DM15	
	C11	Capacitor, Disk, .0047 μfd		
	C12	Capacitor, Dipped Mica, 33 pf	DM15	
	C13	Capacitor, Dipped Mica, 120 pf	DM15	
	C14	Capacitor, Disk, 47 pf		
	C15	Capacitor, Disk, 47 pf		
	C16	Capacitor, Disk, 47 pf		
	C17	Capacitor, Disk, 47 pf		
	C18	Capacitor, Disk, .01 μfd		
	C19	Capacitor, Disk, .01 μfd		
	C20	Capacitor, Disk, .01 μfd		
	C21	Capacitor, Disk, .01 μfd		
	C22	Capacitor, Disk, .01 μfd		
	C23	Capacitor, Disk, .01 μfd		
	C24	Capacitor, Disk, .01 μfd		

Table 5-5 MODEL 42-300 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C25	Capacitor, Disk, .01 µfd		
	C26	Capacitor, Disk, .01 µfd		
	C27	Capacitor, Disk, .1 µfd		
	C28	Capacitor, Disk, .1 µfd		
	C29	Capacitor, Disk, .01 µfd		
	C30	Capacitor, Disk, .01 µfd		
	C31	Capacitor, Disk, .01 µfd		
	C32	Capacitor, Disk, .01 µfd		
	C33	Capacitor, Disk, .01 µfd		
	C34	Capacitor, Disk, .01 µfd		
	C35	Capacitor, Disk, 47 pf		
	C36	Capacitor, Disk, .01 µfd		
	CR1	Crystal, parallel resonance, 2 MHz, 32 pf		
	D1	Diode, Silicon	1N4454	
	D2	Diode, Silicon	1N4454	
	D3	Diode, Silicon	1N4454	
	D4	Diode, Silicon	1N4454	
	D5	Diode, Silicon	1N4454	
	D6	Diode, Silicon	1N4454	
	D7	Diode, Silicon	1N4454	
	D8	Diode, Silicon	1N4454	
	D9	Diode, Silicon	1N4454	
	D10	Diode, Silicon	1N4454	

Table 5-5 MODEL 42-300 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	D11	Diode, Silicon	1N4454	
	D12	Diode, Silicon	1N4454	
	D13	Diode, Silicon	1N4454	
	FC1	Flat Calbe, 18 Pin	1-86945-7	Amp, Inc.
	IC1	Integrated Circuit, Digital, CMOS	CD4012BFX	RCA
	IC2	Integrated Circuit, Digital, CMOS	CD4011BFX	RCA
	IC3	Integrated Circuit, Digital, CMOS	CD4520BFX	RCA
	IC4	Integrated Circuit, Digital, CMOS	CD4518BFX	RCA
	IC5	Integrated Circuit, Digital, CMOS	CD4011BFX	RCA
	IC6	Integrated Circuit, Digital, CMOS	CD4518BFX	RCA
	IC7	Integrated Circuit, Digital, CMOS	CD4046BFX	RCA
	IC8	Integrated Circuit, Op/Amp	LF356H	National
	IC9	Integrated Circuit, Op/Amp	LF356H	National
	IC10	Integrated Circuit, Digital, CMOS	CD4013BFX	RCA
	IC11	Integrated Circuit, Digital, CMOS	CD4518BFX	RCA
	IC12	Integrated Circuit, Digital, CMOS	CD4518BFX	RCA
	IC13	Integrated Circuit, Digital, CMOS	CD4011BFX	RCA
	IC14	Integrated Circuit, Digital, CMOS	CD4046BFX	RCA
	IC15	Integrated Circuit, Digital, CMOS	CD4013BFX	RCA
	IC16	Integrated Circuit, Digital, CMOS	CD4011BFX	RCA
	IC17	Integrated Circuit, Digital, CMOS	CD4011BFX	RCA
	IC18	Integrated Circuit, Digital, CMOS	CD4011BFX	RCA
	IC19	Integrated Circuit, Digital, CMOS	CD4011BFX	RCA

Table 5-5 MODEL 42-300 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	IC20	Integrated Circuit, LSI Counter	MK5005	Mostek
	IC21	Integrated Circuit, Digital, CMOS	CD4013BFX	RCA
	Q1	Transistor, Silicon	MPS-A14	Motorola
	Q2	Transistor, Silicon	MPS-A14	Motorola
	Q3	Transistor, Silicon	MPS-A14	Motorola
	Q4	Transistor, Silicon	MPS-A14	Motorola
	Q5	Transistor, Silicon	2N4401	
	Q6	Transistor, Silicon	2N4401	
	Q7	Transistor, Silicon	2N4401	
	Q8	Transistor, Silicon	2N4401	
	Q9	Transistor, Silicon	2N4401	
	Q10	Transistor, Silicon	2N4401	
	Q11	Transistor, Silicon	2N4401	
	Q12	Transistor, Silicon	2N4401	
	Q13	Transistor, Silicon	2N4401	
	R1	Resistor, Fixed, 6.2 kΩ, 5%	RCR07	AB
	R2	Resistor, Fixed, 160 kΩ, 5%	RCR07	AB
	R3	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R4	Resistor, Fixed, 8.2 kΩ, 5%	RCR07	AB
	R5	Resistor, Fixed, 510 Ω, 5%	RCR07	AB
	R6	Resistor, Fixed, 1 MΩ , 5%	RCR07	AB
	R7	Resistor, Fixed, 330 kΩ, 5%	RCR07	AB
	R8	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB

Table 5-5 MODEL 42-300 PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R9	Resistor, Fixed, 560 kΩ, 5%	RCR07	AB
	R10	Resistor, Fixed, 11 kΩ, 5%	RCR07	AB
	R11	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R12	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R13	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R14	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R15	Resistor, Fixed, 10 MΩ, 5%	RCR07	AB
	R16	Resistor, Fixed, 2 kΩ, 5%	RCR07	AB
	R17	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R18	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R19	Resistor, Fixed, 30 kΩ, 5%	RCR07	AB
	R20	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R21	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R22	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R23	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R24	Resistor, Fixed, 68 kΩ, 5%	RCR07	AB
	R25	Resistor, Fixed, 68 kΩ, 5%	RCR07	AB
	R26	Resistor, Fixed, 4.7 kΩ, 5%	RCR07	AB
	R27	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R28	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R29	Resistor, Fixed, 12 kΩ, 5%	RCR07	AB
	R30	Resistor, Fixed, 12 kΩ, 5%	RCR07	AB
	R31	Resistor, Fixed, 20 kΩ, 5%	RCR07	AB
	R32	Resistor, Fixed, 20 kΩ, 5%	RCR07	AB
	R33	Resistor, Fixed, 20 kΩ, 5%	RCR07	AB

Table 5-5 MODEL 42-300 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R34	Resistor, Fixed, 20 kΩ, 5%	RCR07	AB
	R35	Resistor, Fixed, 1.8 kΩ, 5%	RCR07	AB
	R36	Resistor, Fixed, 1.8 kΩ, 5%	RCR07	AB
	R37	Resistor, Fixed, 1.8 kΩ, 5%	RCR07	AB
	R38	Resistor, Fixed, 1.8 kΩ, 5%	RCR07	AB
	R39	Resistor, Fixed, 1.8 kΩ, 5%	RCR07	AB
	R40	Resistor, Fixed, 1.8 kΩ, 5%	RCR07	AB
	R41	Resistor, Fixed, 1.8 kΩ, 5%	RCR07	AB
	R42	Resistor, Fixed, 62 Ω, 5%	RCR07	AB
	R43	Resistor, Fixed, 62 Ω, 5%	RCR07	AB
	R44	Resistor, Fixed, 62 Ω, 5%	RCR07	AB
	R45	Resistor, Fixed, 62 Ω, 5%	RCR07	AB
	R46	Resistor, Fixed, 62 Ω, 5%	RCR07	AB
	R47	Resistor, Fixed, 62 Ω, 5%	RCR07	AB
	R48	Resistor, Fixed, 62 Ω, 5%	RCR07	AB
	R49	Resistor, Fixed, 62 Ω, 5%	RCR07	AB
	R50	Resistor, Fixed, 62 Ω, 5%	RCR07	AB
	R51	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R52	Resistor, Fixed, 51 kΩ, 5%	RCR07	AB
	R53	Resistor, Fixed, 91 kΩ, 5%	RCR07	AB
	R54	Resistor, Fixed, 5.1 kΩ, 5%	RCR07	AB
	R55	Resistor, Fixed, 5.1 kΩ, 5%	RCR07	AB
	R56	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB

Table 5-6 MODEL 42-301-101 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	DS1-DS4	Display, LED	4640 E	Monsanto
	J1	Connector, 14 Pin	WTS-14-R	RN
	SO1-SO4	Socket, 14 Pin, DIP	C931402	TI

Table 5-7 MODEL 42-400 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C1	Capacitor, Disk, .1 µfd, 10 V		
	C2	Capacitor, Disk, .1 µfd, 10 V		
	C3	Capacitor, Electrolytic, 50 µfd, 35 V		
	C4	Capacitor, Electrolytic, 50 µfd, 35 V		
	C5	Capacitor, Tantalum electrolytic, 22 µfd, 15 V, 10%	CS13	
	C6	Capacitor, Tantalum electrolytic, 22 µfd, 15 V, 10%	CS13	
	C7	Capacitor, Tantalum electrolytic, 22 µfd, 15 V, 10%	CS13	
	C8	Capacitor, Dipped Mica, 68 pf	DM15	
	C9	Capacitor, Dipped Mica, 18 pf	DM15	
	C10	Capacitor, .47 µfd, 100 V, 5%	B32541	Siemens
	C11	Capacitor, Dipped Mica, 510 pf	DM15	
	C12	Capacitor, Polystrene, .01 µfd, 1%	611	Mial
	C13	Capacitor, Disk, .1 µfd		
	C14	Capacitor, Polystrene, .022 µfd, 1%	611	Mial
	C15	Capacitor, Tantalum electrolytic, 22 µfd, 15 V, 10%	CS13	
	C16	Capacitor, .47 µfd, 100 V, 5%	B32541	Siemens
	C17	Capacitor, .47 µfd, 100 V, 5%	B32541	Siemens
	C18	Capacitor, Disk, .01 µfd, 50 V		
	C19	Capacitor, Tantalum electrolytic, 22 µfd, 15 V, 10%	CS13	
	C20	Capacitor, Tantalum electrolytic, 22 µfd, 15 V, 10%	CS13	
	C21	Capacitor, Polystyrene, 4700 pf, 1%	611	Mial
	C22	Capacitor, Polystyrene, .012 µfd, 1%	611	Mial
	C23	Capacitor, Polystyrene, 680 pf, 1%	611	Mial
	C24	Capacitor, Polystyrene, .047 µfd, 1%	611	Mial

Table 5-7 MODEL 42-400 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C25	Capacitor, Polystrene, 1000 pf, 1%	611	Mial
	C26	Capacitor, Polystrene, .047 µfd, 1%	611	Mial
	C27	Capacitor, Polystrene, 1000 pf, 1%	611	Mial
	C28	Capacitor, Disk, .1 µfd, 20 V		
	C29	Capacitor, Dipped Mica, 100 pf	DM15	
	C30	Capacitor, Polystrene, 1000 pf, 1%	611	Mial
	C31	Capacitor, Polystyrene, .047 µfd, 1%	611	Mial
	C32	Capacitor, Dipped Mica, 510 pf	DM15	
	C33	Capacitor, Electrolytic, Selected Value		
	C34	Capacitor, Polystyrene, 750 pf, 1%	611	Mial
	C35	Capacitor, 75 µfd, 100 V	39D756F100FJ4	Sprague
	C36	Capacitor, 75 µfd, 100 V	39D756F100FJ4	Sprague
	C37	Capacitor, Disk, .01 µfd, 50 V		
	C38	Capacitor, Disk, .01 µfd, 50 V		
	C39	Capacitor, Tantalum electrolytic, 22 µfd, 15 V, 10%	CS13	
	C40	Capacitor, Disk, .01 µfd, 50 V		
	C41	Capacitor, Disk, .01 µfd, 50 V		
	C42	Capacitor, Disk, .01 µfd, 50 V		
	C43	Capacitor, Disk, .01 µfd, 50 V		
	C44	Capacitor, Disk, .01 µfd, 50 V		
	C45	Capacitor, Disk, .01 µfd, 50 V		
	C46	Capacitor, Disk, .01 µfd, 50 V		
	C47	Capacitor, Disk, .01 µfd, 50 V		
	C48	Capacitor, Disk, .1 µfd, 10 V		
	C49	Capacitor, Disk, .01 µfd, 50 V		

Table 5-7 MODEL 42-400 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C50	Capacitor, Disk, .01 µfd, 50 V		
	C51	Capacitor, Disk, .01 µfd, 50 V		
	C52	Capacitor, Disk, .1 µfd, 50 V		
	C53	Capacitor, Disk, .01 µfd, 50 V		
	C54	Capacitor, Disk, .01 µfd, 50 V		
	C55	Capacitor, Disk, .01 µfd, 50 V		
	C56	Capacitor, Disk, .1 µfd, 10 V		
	C57	Capacitor, Disk, .1 µfd, 10 V		
	C58	Capacitor, Tantalum electrolytic, 22 µfd, 15 V, 1%	CS13	
	C59	Capacitor, Dipped Mica, 1600 pf.	DM19	
	C60	Capacitor, Polystyrene, 1300 pf	611	Mial
	C61	Capacitor, Polystyrene, .0068 µfd	611	Mial
	C62	Capacitor, Polystyrene, 680 pf	611	Mial
	D1	Diode, Silicon	1N4454	
	D2	Diode, Zener	1N823A	
	IC1	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	IC2	Integrated Circuit, Digital, CMOS	CD4066BFX	RCA
	IC3	Integrated Circuit, Digital, CMOS	CD4046BFX	RCA
	IC4	Integrated Circuit, Digital, CMOS	CD4013BFX	RCA
	IC5	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	IC6	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	IC7	Integrated Circuit, Digital, CMOS	CD4011BFX	RCA
	IC8	Integrated Circuit, Digital, CMOS	CD4510BFX	RCA

Table 5-7 MODEL 42-400 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	IC9	Integrated Circuit, Digital, CMOS	CD4028BFX	RCA
	IC10	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	IC11	Integrated Circuit, Digital, CMOS	CD4066BFX	RCA
	IC12	Integrated Circuit, Digital, CMOS	CD4066BFX	RCA
	IC13	Integrated Circuit, Digital, CMOS	CD4066BFX	RCA
	IC14	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	IC15	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	IC16	Integrated Circuit, Digital, CMOS	CD4011BFX	RCA
	IC17	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	IC18	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	IC19	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	IC20	Integrated Circuit, Op/Amp	LF356H	National
	IC21	Integrated Circuit, Op/Amp	LF356H	National
	IC22	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	J1	Connector, 18 Pin	583773-8	Amp, Inc.
	Q1	Transistor, Silicon	2N4401	
	Q2	Transistor, Silicon	2N4403	
	Q3	Transistor, Silicon	MPSA18	Motorola
	R1	Resistor, Fixed, 150 Ω, 5%	RCR07	AB
	R2	Resistor, Fixed, 12 kΩ, 5%	RCR07	AB
	R3	Resistor, Fixed, 51 kΩ, 5%	RCR07	AB

Table 5-7 MODEL 42-400 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R5	Resistor, Fixed, 1.1 kΩ, 5%	RCR07	AB
	R6	Resistor, Fixed, 51 kΩ, 5%	RCR07	AB
	R7	Resistor, Fixed, 15 kΩ, 1%	RN55D	AB
	R8	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R9	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R10	Resistor, Fixed, Selected Value	RN55D	AB
	R11	Resistor, Fixed, 1.5 kΩ, 5%	RCR07	AB
	R12	Resistor, Fixed, 12 kΩ, 5%	RCR07	AB
	R13	Resistor, Fixed, 23.7 kΩ, 1%	RN55D	AB
	R14	Resistor, Fixed, 510 Ω, 5%	RCR07	AB
	R15	Resistor, Fixed, 68.1 kΩ, 1%	RN55D	AB
	R16	Resistor, Fixed, 23.2 kΩ, 1%	RN55D	AB
	R17	Resistor, Fixed, 23.2 kΩ, 1%	RN55D	AB
	R18	Resistor, Fixed, 68.1 kΩ, 1%	RN55D	AB
	R19	Resistor, Fixed, 23.2 kΩ, 1%	RN55D	AB
	R20	Resistor, Fixed, 23.2 kΩ, 1%	RN55D	AB
	R21	Resistor, Variable, 5 kΩ, 10%	72PMR5K	Beckman
	R22	Resistor, Fixed, 39.2 kΩ, 1%	RN55D	AB
	R23	Resistor, Fixed, Selected Value	RN55D	AB
	R24	Resistor, Fixed, 274 Ω, 1%	RN55D	AB
	R25	Resistor, Fixed, 30.1 kΩ	RN55D	AB
	R26	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R27	Resistor, Fixed, 20 kΩ, 1%	RN55D	AB
	R28	Resistor, Fixed, 47 kΩ, 5%	RN55D	AB
	R29	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB

Table 5-7 MODEL 42-400 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R30	Resistor, Fixed, 33.2 kΩ, 1%	RN55D	AB
	R31	Resistor, Fixed, 51.1 kΩ, 1%	RN55D	AB
	R32	Resistor, Fixed, 1 kΩ, 1%	RN55D	AB
	R33	Resistor, Fixed, 100 kΩ, 1%	RN55D	AB
	R34	Resistor, Fixed, 30.9 kΩ, 1%	RN55D	AB
	R35	Resistor, Fixed, 20 kΩ, 1%	RN55D	AB
	R36	Resistor, Fixed, 100 kΩ, 1%	RN55D	AB
	R37	Resistor, Fixed, 100 kΩ, 1%	RN55D	AB
	R38	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R39	Resistor, Fixed, 2.4 MΩ, 5%	RCR07	AB
	R40	Resistor, Fixed, 2.4 MΩ, 5%	RCR07	AB
	R41	Resistor, Fixed 634 kΩ, 1%	RN55D	AB
	R42	Resistor, Fixed, 213.9 kΩ, .1%	RN55C	ACI
	R43	Resistor, Fixed, 130.4 kΩ, .1%	RN55C	ACI
	R44	Resistor, Fixed, 95.44 kΩ, .1%	RN55C	ACI
	R45	Resistor, Fixed, 76.77 kΩ, .1%	RN55C	ACI
	R46	Resistor, Fixed, 65.50 kΩ, .1%	RN55C	ACI
	R47	Resistor, Fixed, 58.39 kΩ, .1%	RN55C	ACI
	R48	Resistor, Fixed, 53.87 kΩ, .1%	RN55C	ACI
	R49	Resistor, Fixed, 51.17 kΩ, .1%	RN55C	ACI
	R50	Resistor, Fixed, 49.90 kΩ, .1%	RN55C	ACI
	R51	Resistor, Fixed, 300 kΩ, 5%	RCR07	AB
	R52	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R53	Resistor, Fixed, 300 kΩ, 5%	RCR07	AB

Table 5-7 MODEL 42-400 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R54	Resistor, Fixed, 25.5 kΩ, 1%	RN55D	AB
	R55	Resistor, Fixed, 316 kΩ, 1%	RN55D	AB
	R56	Resistor, Fixed, 137 Ω, 1%	RN55D	AB
	R57	Resistor, Fixed, 10.2 kΩ, 1%	RN55D	AB
	R58	Resistor, Fixed, 357 kΩ, 1%	RN55D	AB
	R59	Resistor, Fixed, 340 Ω, 1%	RN55D	AB
	R60	Resistor, Fixed, 2.87 kΩ, 1%	RN55D	AB
	R61	Resistor, Fixed, 357 kΩ, 1%	RN55D	AB
	R62	Resistor, Fixed, 562 Ω, 1%	RN55D	AB
	R63	Resistor, Fixed, 1 MΩ, 5%	RCR07	AB
	R64	Resistor, Fixed, 1 MΩ, 5%	RCR07	AB
	R65	Resistor, Fixed, 1 MΩ, 5%	RCR07	AB
	R66	Resistor, Fixed, 1 MΩ, 5%	RCR07	AB
	R67	Resistor, Variable, 100 kΩ, 10%	72PMR100K	Beckman
	R68	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R69	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R70	Resistor, Fixed, 8.87 kΩ, 1%	RN55D	AB
	R71	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R72	Resistor, Fixed, 240 kΩ, 5%	RCR07	AB
	R73	Resistor, Fixed, 9.53 kΩ, 1%	RN55D	AB
	R74	Resistor, Variable, 1 kΩ, 10%	72PMR1K	Beckman
	R75	Resistor, Fixed, 133 kΩ, 1%	RN55D	AB
	R76	Resistor, Fixed, 35.7 kΩ, 1%	RN55D	AB
	R77	Resistor, Fixed, 7.32 kΩ, 1%	RN55D	AB

Table 5-7

MODEL 42-400 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R78	Resistor, Fixed, 1.50 kΩ, 1%	RN55D	AB
	R79	Resistor, Fixed, 133 kΩ, 1%	RN55D	AB
	R80	Resistor, Fixed, 35.7 kΩ, 1%	RN55D	AB
	R81	Resistor, Fixed, 7.32 kΩ, 1%	RN55D	AB
	R82	Resistor, Fixed, 1.50 kΩ, 1%	RN55D	AB
	R83	Resistor, Fixed, 133 kΩ, 1%	RN55D	AB
	R84	Resistor, Fixed, 35.7 kΩ, 1%	RN55D	AB
	R85	Resistor, Fixed, 7.32 kΩ, 1%	RN55D	AB
	R86	Resistor, Fixed, 1.50 kΩ, 1%	RN55D	AB
	R87	Resistor, Fixed, 12.1 kΩ, 1%	RN55D	AB
	R88	Resistor, Fixed, 3.74 kΩ, 1%	RN55D	AB
	R89	Resistor, Fixed, 40.2 kΩ, 1%	RN55D	AB
	R90	Resistor, Fixed, 40.2 kΩ, 1%	RN55D	AB
	R91	Resistor, Fixed, 3.74 kΩ, 1%	RN55D	AB
	R92	Resistor, Fixed, 20 kΩ, 1%	RN55D	AB
	R93	Resistor, Fixed, 30.1 kΩ, 1%	RN55D	AB
	R94	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R95	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R96	Resistor, Fixed, 1 MΩ, 1%	RN55D	AB
	R97	Resistor, Variable, 10 kΩ, 10%	89PR10K	Beckman
	R98	Not Used		
	R99	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R100	Not Used		
	R101	Not Used		

Table 5-7 MODEL 42-400 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R102	Not Used		
	R103	Resistor, Fixed, 4.99 kΩ, 1%	RN55D	AB
	R104	Resistor, Fixed, 49.9 kΩ, 1%	RN55D	AB
	R105	Resistor, Fixed, 12.1 kΩ, 1%	RN55D	AB
	R106	Resistor, Fixed, 150 Ω, 1%	RN55D	AB
	R107	Resistor, Variable, 10 kΩ, 10%	89PR10K	Beckman
	R108	Resistor, Fixed, 2.4 MΩ, 5%	RCR07	AB
	R109	Resistor, Fixed, 32.27 kΩ, .1%	RN55C	ACI
	R110	Resistor, Fixed, 14.49 kΩ, .1%	RN55C	ACI
	R111	Resistor, Fixed, 10 kΩ, 1%	RN55D	AB
	R112	Resistor, Fixed, 301 Ω, 1%	RN55D	AB
	R113	Resistor, Fixed, Selected Value	RN55D	AB
	R114	Resistor, Fixed, Selected Value	RN55D	AB
	R115	Resistor, Variable, 5 kΩ, 10%	89PR5K	Beckman
	R116	Resistor, Fixed, 100 kΩ, 1%	RN55D	AB
	R117	Resistor, Fixed, 1.74 kΩ, 1%	RN55D	AB
	R118	Resistor, Variable, 1 kΩ, 10%	89PR1K	Beckman
	R119	Resistor, Fixed, 12.1 kΩ, 1%	RN55D	AB
	R120	Resistor, Fixed, 49.9 kΩ, 1%	RN55D	AB
	R121	Resistor, Fixed, 20.0 kΩ, 1%	RN55D	AB
	R122	Resistor, Fixed, 1.3 kΩ, 1%	RN55D	AB
	R123	Resistor, Fixed, 51 kΩ, 5%	RCR07	AB
	R124	Resistor, Fixed, 5k kΩ, 5%	RCR07	AB
	R125	Resistor, Fixed, 51 kΩ, 5%	RCR07	AB

Table 5-7

MODEL 42-400 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R126	Resistor, Fixed, 51 kΩ, 5%	RCR07	AB
	R127	Resistor, Variable, 10 kΩ, 10%	72PMR10K	Beckman
	R128	Resistor, Fixed, 2.05 kΩ, 1%	RN55D	AB
	R129	Resistor, Fixed, 100 kΩ, 1%	RN55D	AB
	R130	Resistor, Fixed, Selected Value	RN55D	AB
	S1-S10	Switch Pushbutton	TSL-770224-B1	Schadow
	T1	Transformer, 600Ω Output, 200 Hz	TM3440	HLI
	T1	Transformer, 600Ω Output, 40 Hz	3-20280	ADC

Table 5-8 MODEL 42-500 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C1	Capacitor, Disk, .1 µfd, 20 V		
	C2	Capacitor, Tantalum electrolytic, 22 µfd, 35 V		
	C3	Capacitor, Disk, .001 µfd		
	C4	Capacitor, Disk, .1 µfd, 20 V		
	C5	Capacitor, Tantalum electrolytic, 22 µfd, 35 V		
	C6	Capacitor, Disk, .047 µfd, 50 V		
	C7	Capacitor, Disk, .001 µfd		
	C8	Capacitor, 220 µfd, 40 V	B41208	Siemens
	C9	Capacitor, Aluminum electrolytic, 1000 µfd, 40 V	39D	Sprague
	C10	Capacitor, Aluminum electrolytic, 1000 µfd, 40 V	39D	Sprague
	C11	Capacitor, Disk, .01 µfd, 50 V		
	C12	Capacitor, Disk, .1 µfd, 20 V		
	C13	Capacitor, Disk, .1 µfd, 20 V		
	C14	Capacitor, Tantalum electrolytic, 22 µfd, 15 V, 10%	CS13	
	C15	Capacitor, Disk, .047 µfd, 50 V		
	C16	Capacitor, Electrolytic, 50 µfd, 35 V		
	C17	Capacitor, Disk, .1 µfd, 20 V		
	C18	Capacitor, Disk, .1 µfd, 20 V		
	C19	Capacitor, Tantalum electrolytic, 22 µfd, 15 V, 10%	CS13	
	C20	Capacitor, Disk, .047 µfd, 50 V		
	C21	Capacitor, Electrolytic, 50 µfd, 35 V		
	C22	Capacitor, Electrolytic, 5 µfd, 100 V		
	C23	Capacitor, Electrolytic, 220 µfd, 40 V	B41285	Siemens
	C24	Capacitor, Electrolytic, 220 µfd, 25 V	B41285	Siemens
	C25	Capacitor, Polycarbonate, 0.22 µfd, 250 V	B32541	Siemens

Table 5-8 MODEL 42-500 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C26	Capacitor, Tantalum electrolytic, 2.2 µfd, 15 V, 10%	CS13	
	C27	Capacitor, Polycarbonate, 0.22 µfd, 250 V	B32541	Siemans
	C28	Capacitor, Polycarbonate, .1 µfd, 100 V	B32541	Siemens
	C29	Capacitor, Disk, .01 µfd		
	C30	Capacitor, Polycarbonate, .018 µfd, 100 V	B32541	Siemens
	D1	Diode, Rectifier	1N4004	
	D2	Diode, Bridge	KBP-04	
	D3	Diode, Zener	1N823A	
	D4	Diode, Silicon	1N4454	
	D5	Diode, Rectifier	MR812	Motorola
	D6	Diode, Rectifier	1N4004	
	D7	Diode, Rectifier	MR812	Motorola
	D8	Diode, Silicon	1N4454	
	D9	Diode, Zener	1N5740B	
	D10	Diode, Rectifier	MR812	Motorola
	F1	Fuse, 1A Slow Blow	3AG	Littelfuse
	F2	Fuse, 1A, Slow Blow	3AG	Littelfuse
	IC1	Integrated Circuit, Regulator	LM305H	National
	IC2	Integrated Circuit, Regulator	LM304H	National
	IC3	Integrated Circuit, Dual, Op/Amp	RC4558P	TI
	L1	Inductor, Toriod, 10 mh	EWC4419	EWC

Table 5-8 MODEL 42-500 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	Q1	Transistor, Silicon	2N4401	
	Q2	Transistor, Silicon	2N5192	
	Q3	Transistor, Silicon	2N5194	
	Q4	Transistor, Silicon	2N4403	
	Q5	Transistor, Silicon	2N5194	
	Q6	Transistor, Silicon	MPS-A65	Motorola
	Q7	Transistor, Silicon	MPS-U01A	Motorola
	Q8	Transistor, Silicon	2N4401	
	Q9	Transistor, Silicon	2N4403	
	Q10	Transistor, Silicon	MPS-U51A	Motorola
	Q11	Transistor, Silicon	2N4401	
	Q12	Transistor, Silicon	2N5192	
	Q13	Transistor, Silicon	2N4401	
	Q14	Transistor, Silicon	2N5192	
	Q15	Transistor, Silicon	2N5192	
	Q16	Transistor, Silicon	2N5192	
	Q17	Transistor, Silicon	2N5194	
	Q18	Transistor, Silicon	2N5194	
	Q19	Transistor, Silicon	2N4403	
	Q20	Transistor, Silicon	MPS-U01A	Motorola
	R1	Resistor, Fixed, 2.7 Ω, 5%	RCR20	AB
	R2	Resistor, Fixed, 8.06 kΩ, 1%	RN55D	AB
	R3	Resistor, Variable, 200 Ω, 10%	72PMR200	Beckman

Table 5-8 MODEL 42-500 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R4	Resistor, Fixed, 1.0 kΩ, 1%	RN55D	AB
	R5	Resistor, Fixed, 100 Ω, 5%	RCR07	AB
	R6	Resistor, Fixed, 6.98 kΩ, 1%	RN55D	AB
	R7	Resistor, Variable, 1 kΩ, 10%	72PMR1K	Beckman
	R8	Resistor, Fixed, 2.4 kΩ, 5%	RCR07	AB
	R9	Resistor, Fixed, 2.7 Ω, 5%	RCR20	AB
	R10	Resistor, Fixed, 511 Ω, 1%	RN55D	AB
	R11	Resistor, Fixed, .47 Ω, 5%, 2W	BWH	TRW
	R12	Resistor, Fixed, 1 kΩ, 5%	RCR07	AB
	R13	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R14	Resistor, Fixed, 1 kΩ, 5%	RCR07	AB
	R15	Resistor, Fixed, 301 Ω, 1%	RN55D	AB
	R16	Resistor, Fixed, 442 Ω, 1%	RN55D	AB
	R17	Resistor, Variable, 1 kΩ, 10%	72PMR1K	Beckman
	R18	Resistor, Fixed, 2.74 kΩ, 1%	RN55D	AB
	R19	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R20	Resistor, Fixed, 100 Ω, 5%	RCR07	AB
	R21	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R22	Resistor, Fixed, 1 kΩ, 5%	RCR07	AB
	R23	Resistor, Fixed, 0.47 Ω, 5%, 2W	BWH	TRW
	R24	Resistor, Fixed, 1 kΩ, 5%	RCR07	AB
	R25	Resistor, Fixed, 100 Ω, 5%	RCR07	AB
	R26	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R27	Resistor, Fixed, 10.0 kΩ, 1%	RN55D	AB

Table 5-8 MODEL 42-500 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	R28	Resistor, Fixed, 10.0 kΩ, 1%	RN55D	AB
	R29	Resistor, Fixed, 100 kΩ, 5%	RCR07	AB
	R30	Resistor, Fixed, 820 Ω, 5%	RCR20	AB
	R31	Resistor, Fixed, 10 kΩ, 5%	RN55D	AB
	R32	Resistor, Fixed, 0.47 Ω, 5%, 2W	BWH	TRW
	R33	Resistor, Fixed, .047 Ω, 5%, 2W	BWH	TRW
	R34	Resistor, Fixed, 9.09 kΩ, 1%	RN55D	AB
	R35	Resistor, Fixed, 16.2 kΩ, 1%	RN55D	AB
	R36	Resistor, Fixed, 38 kΩ, 5%	RCR07	AB
	R37	Resistor, Fixed, 2 kΩ, 5%	RCR07	AB
	R38	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R39	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R40	Resistor, Fixed, 0.47 Ω, 5%, 2W	BWH	TRW
	R41	Resistor, Fixed, 560 Ω, 5%	RCR07	AB
	R42	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R43	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB
	R44	Resistor, Fixed, 11 kΩ, 1%	RN55D	AB
	R45	Resistor, Fixed, 10 kΩ, 5%	RCR07	AB

Table 5-9 MODEL 42-600 BOARD PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C1	Capacitor, Tantalum Electrolytic, 2.2 µfd, 15 V, 10%	CS13	Kemits
	D1	Diode, Bridge	KBP-04	General Instruments
	L1, L2	Inductor, 1 mh	WEE-1000	Wee-Ductor
	Q1	Transistor, Silicon	MJE-182	Motorola
	Q2	Transistor, Silicon	MPS-A14	Motorola
	Q3	Transistor, Silicon	2N2484	
	R1	Resistor, Fixed, 30.9 Ω, 1%	RN55D	AB
	R2	Resistor, Fixed, 1.0 MΩ, 1%	RN55D	AB

Table 5-10 POWER SUPPLY SUBASSEMBLY INTERCONNECT PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C1, C2	Capacitor, Disk, .01 µfd, 1 kV	GMV,Z5U	Centralab
	F1	Fuse, 1A, Slow Blow	3AG	Littelfuse
	S1	Switch, Slide, 2P2T	G326004A	
	S2	Switch, Toggle, 2P2T	7201 SYZQ	C&K
	T1, T2	Transformer, Power	EWC 4172	EWC

Table 5-11 POWER SUPPLY/BATTERY CHARGER INTERCONNECT PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	B1, B2	Battery, 12 V, 1.5 AH	12 V 1.5	Eagle-Picher
	C1, C2	Capacitor, Disk, .01 µfd, 1 k V	GMV, 25 U	Centralab
	F1	Fuse, 1A, Slow Blow	3AG	Littelfuse
	M1	Meter, Battery indicator	39TM502	Mouser Electronics
	S1	Switch, Slide, 2P2T	G3260004A	
	S2	Switch, Toggle, On-Off-On, 2 pole	7303SYZQ	C&K
	T1, T2	Transformer, Power	RWC4172	EWC

Table 5-12 42-01 MAINFRAME PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	C1	Not Used		
	C2	Capacitor, Polycarbonate, .1 µfd, 100 V, 5%	B32541	Siemens
	C3	Capacitor, Polycarbonate, .47 µfd, 100 V, 5%	B32541	Siemens
	J1, J2	Jack, 310	M112B	Switch craft
	J3, J4	Jack, Insulated, 310	MN112B	Switch craft
	J5, J6	Connector, 22 Pin	50-44A-30	Cinch
	J7	Connector, Dip	11108-S-18-SE	Scanbe
	LS1	Speaker	BS1740	Knowles
	R1	Resistor, Variable, 10 kΩ, 10%	WA2G032-P103DA	AB
	R2, R3	Resistor, Variable, 10 Turn, 20 kΩ, 5%	7286R20 KL.25	Beckman
	R4	Not Used		
	R5	Not Used		
	R6	Resistor, Fixed, 330 Ω, 5%	RCR07	AB
	R7	Resistor, Fixed, 220 kΩ, 5%	RCR07	AB
	R8	Resistor, Fixed, 2 kΩ, 5%	RCR07	AB
	R9	Resistor, Fixed, 1 kΩ, 5%	RCR07	AB
	R10	Resistor, Fixed, 2 kΩ, 5%	RCR07	AB
	S1	Switch, Toggle	7308SYZQ	C&K
	S2	Switch, Toggle	7401SYZQ	C&K
	S3	Switch, Toggle	7201SYZQ	C&K
	S4	Switch, Toggle	7401SYZQ	C&K

Table 5-12 42-01 MAINFRAME PARTS LIST

Fig.No.	Ref. No.	Description	Part No.	Mfr.
	S5	Switch, Toggle	7301SYZQ	C&K
	TR1, TR2	Communications Gap	GC-230L	Signalite

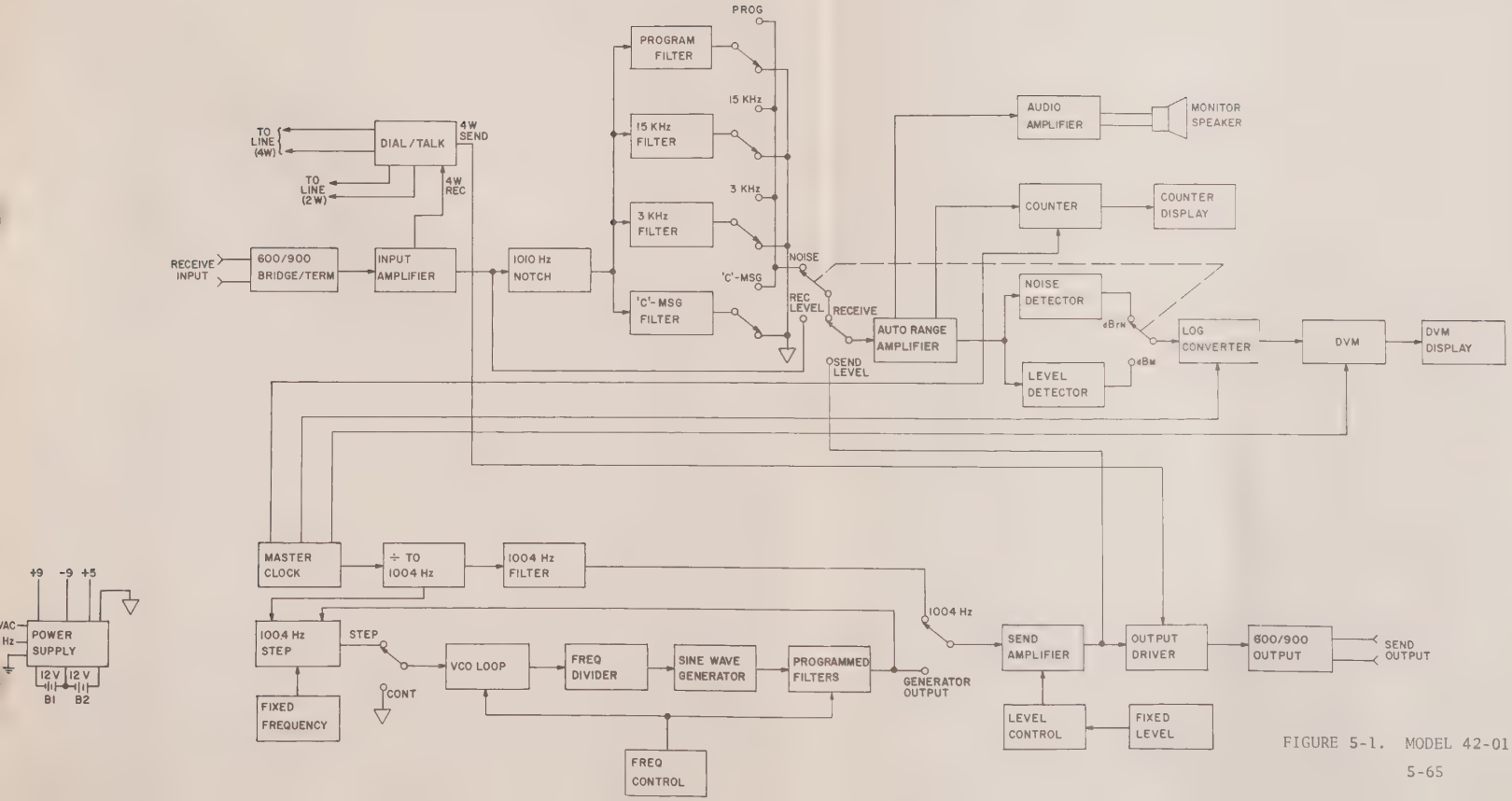

FIGURE 5-1. MODEL 42-01 BLOCK DIAGRAM

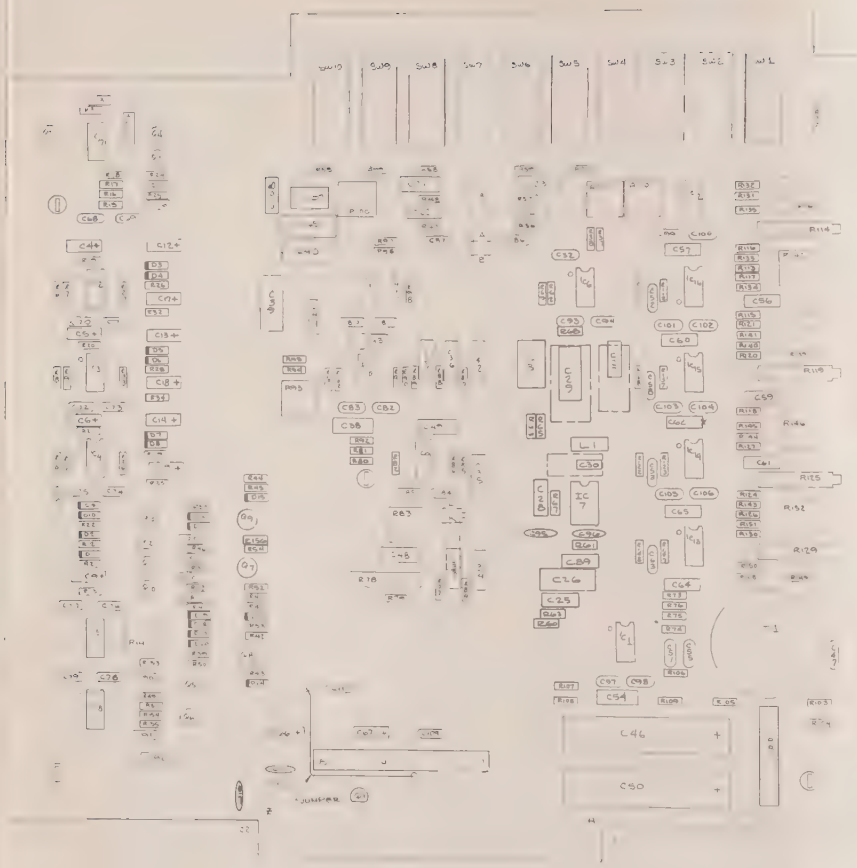

FIGURE 5-2. 42-101 BOARD COMPONENT LAYOUT

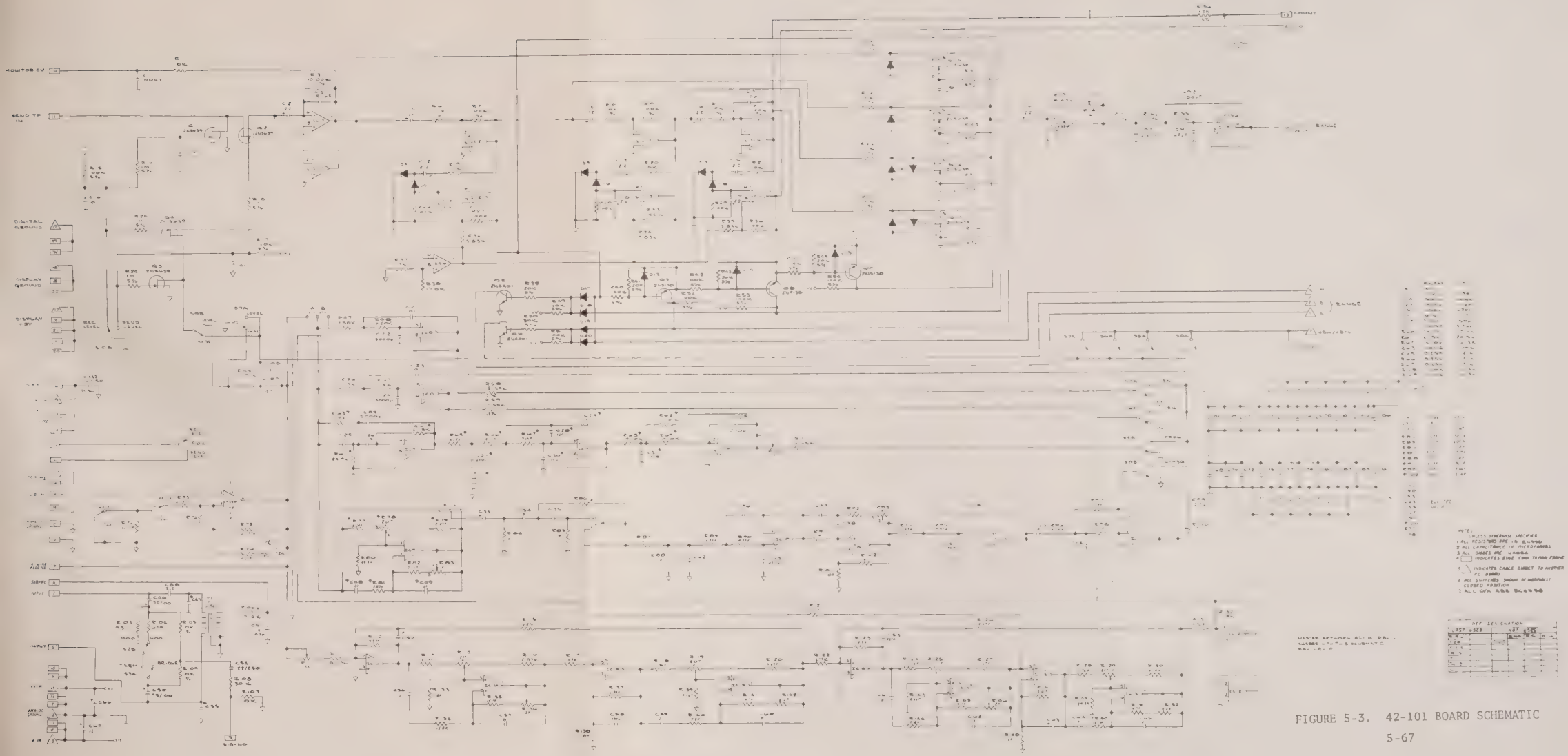

FIGURE 5-3. 42-101 BOARD SCHEMATIC

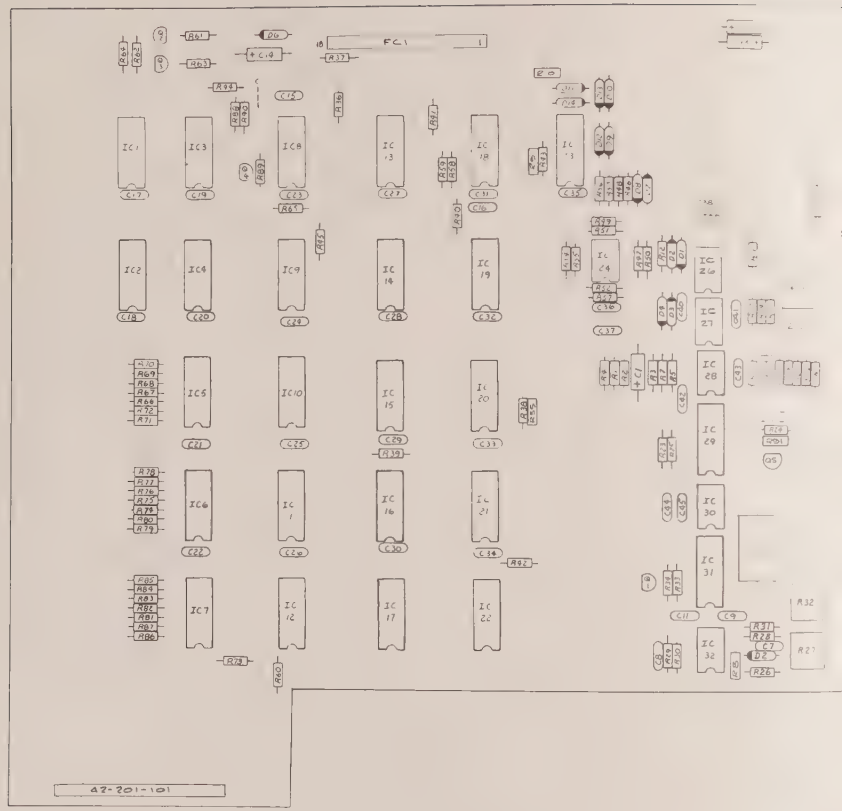

FIGURE 5-4. 42-201 BOARD COMPONENT LAYOUT

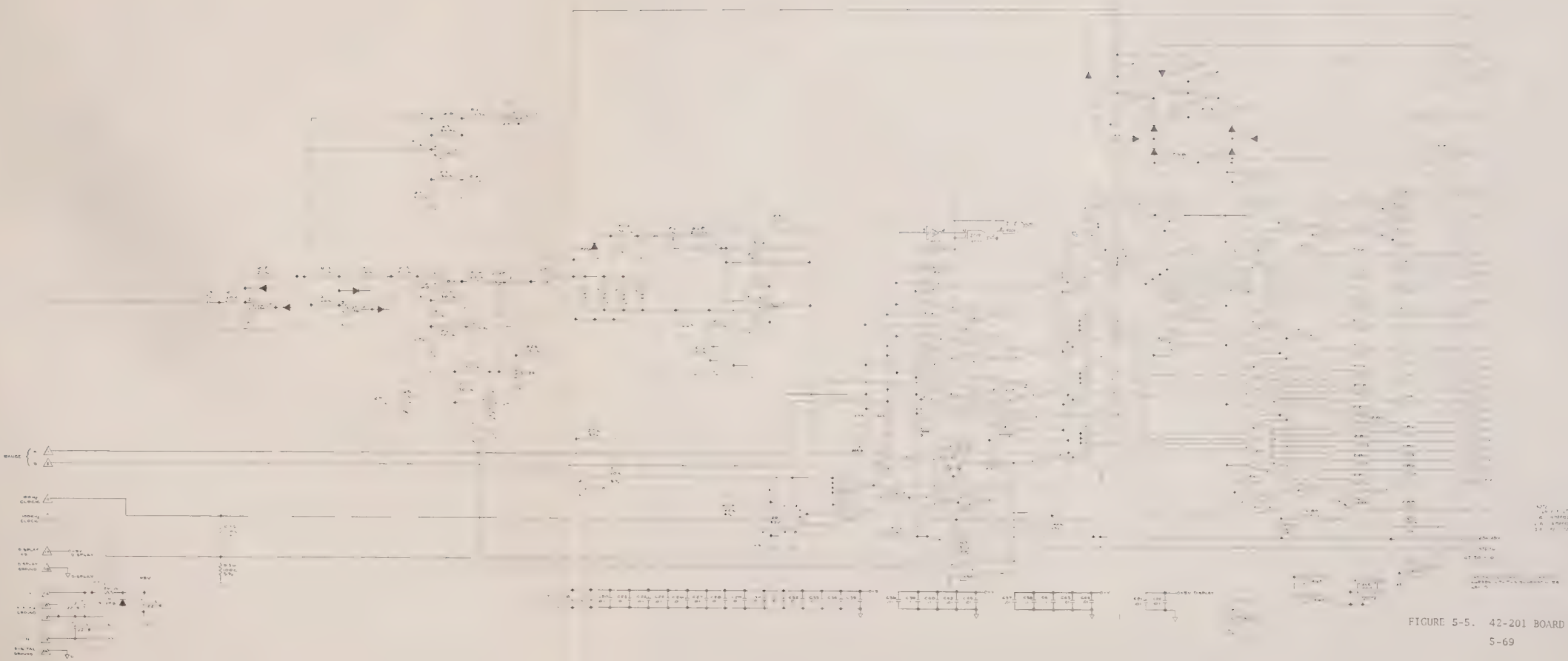

FIGURE 5-5. 42-201 BOARD SCHEM

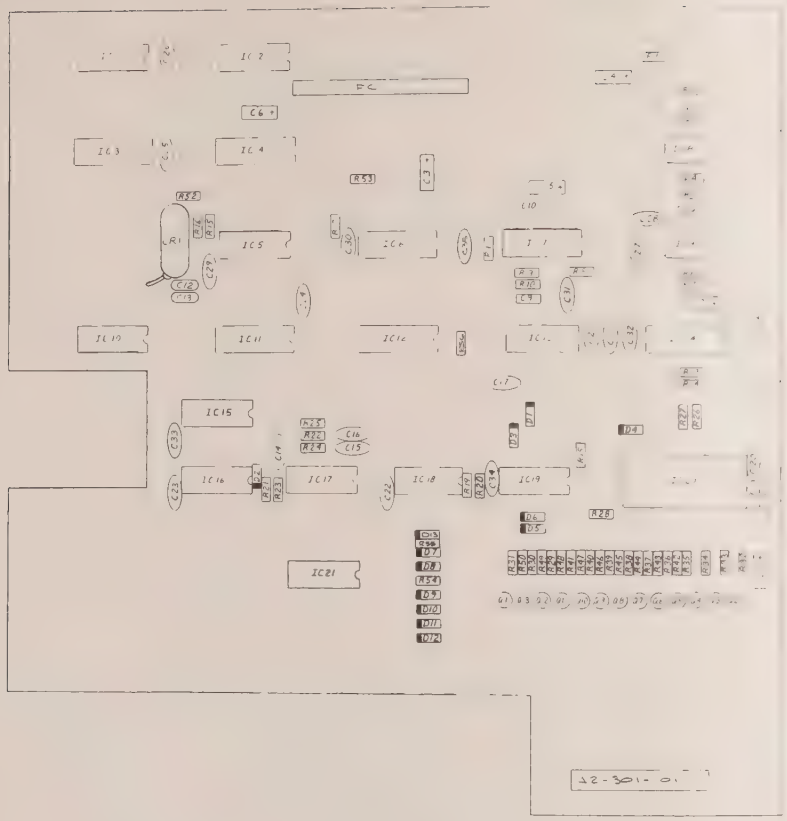

FIGURE 5-6. 42-304 BOARD COMPONENT LAYOUT

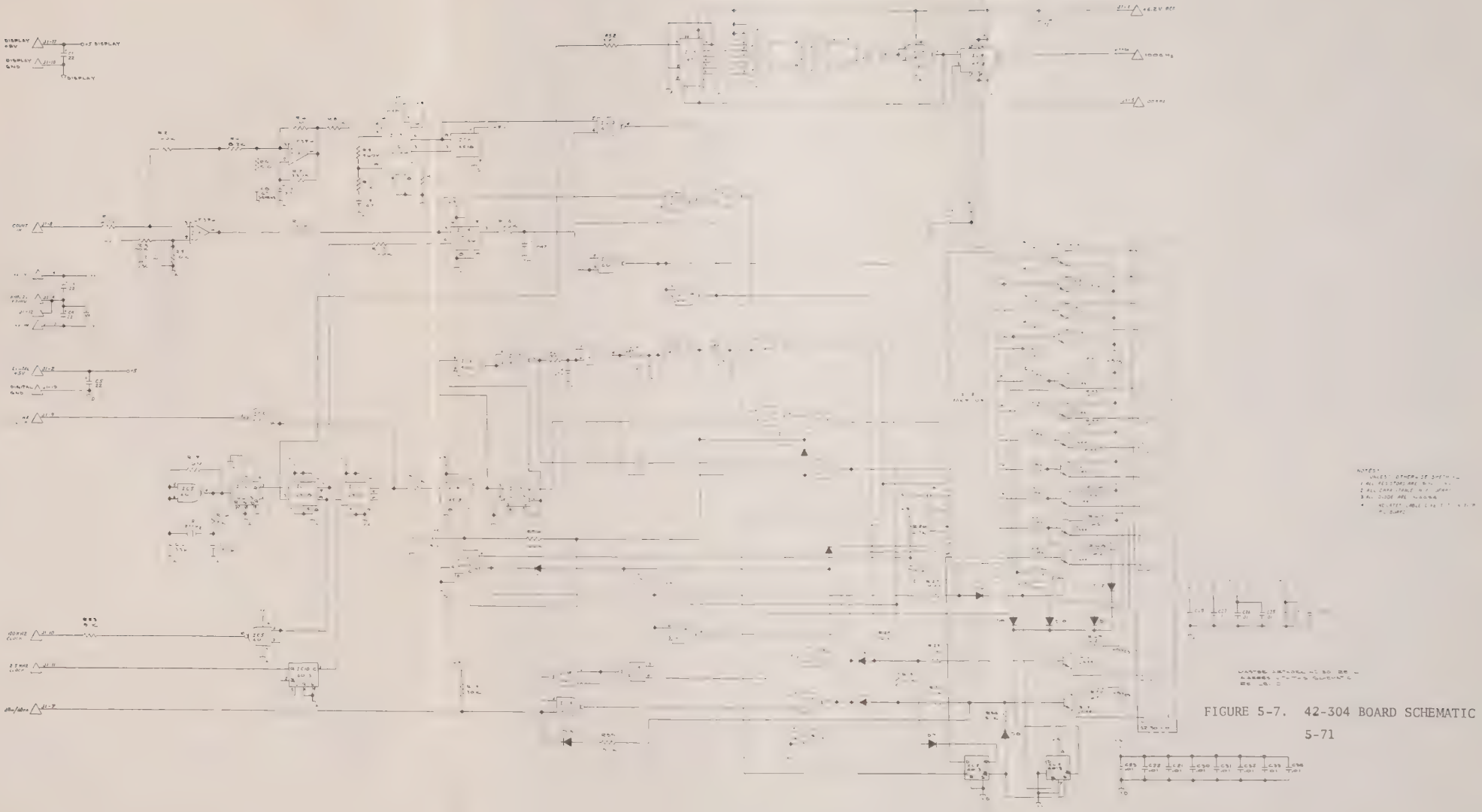

FIGURE 5-7. 42-304 BOARD SCHEMATIC

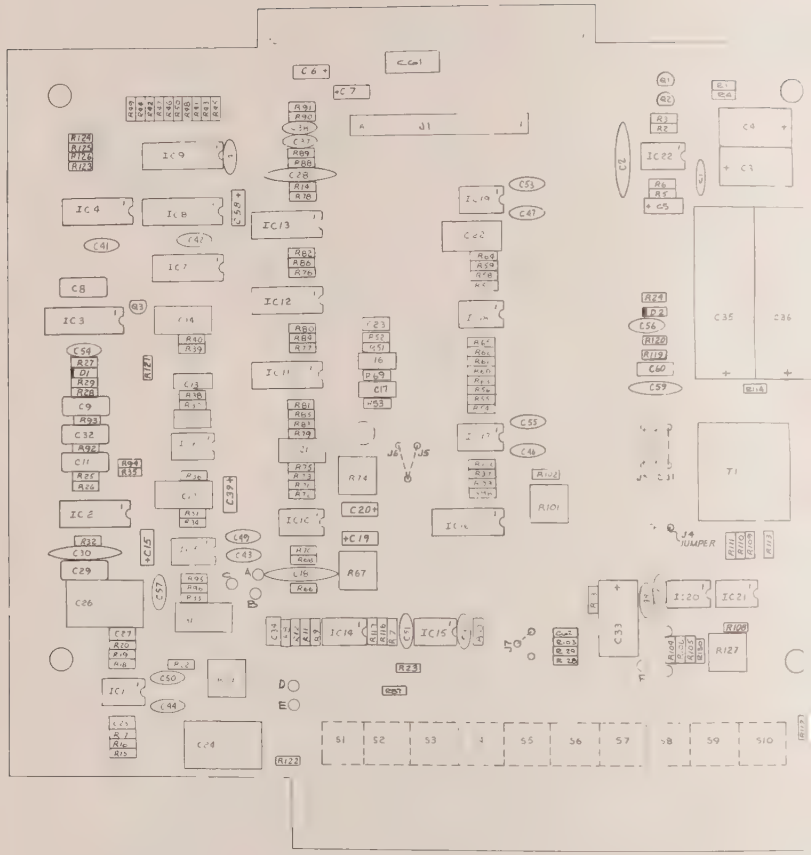

FIGURE 5-8. 42-404 BOARD COMPONENT LAYOUT

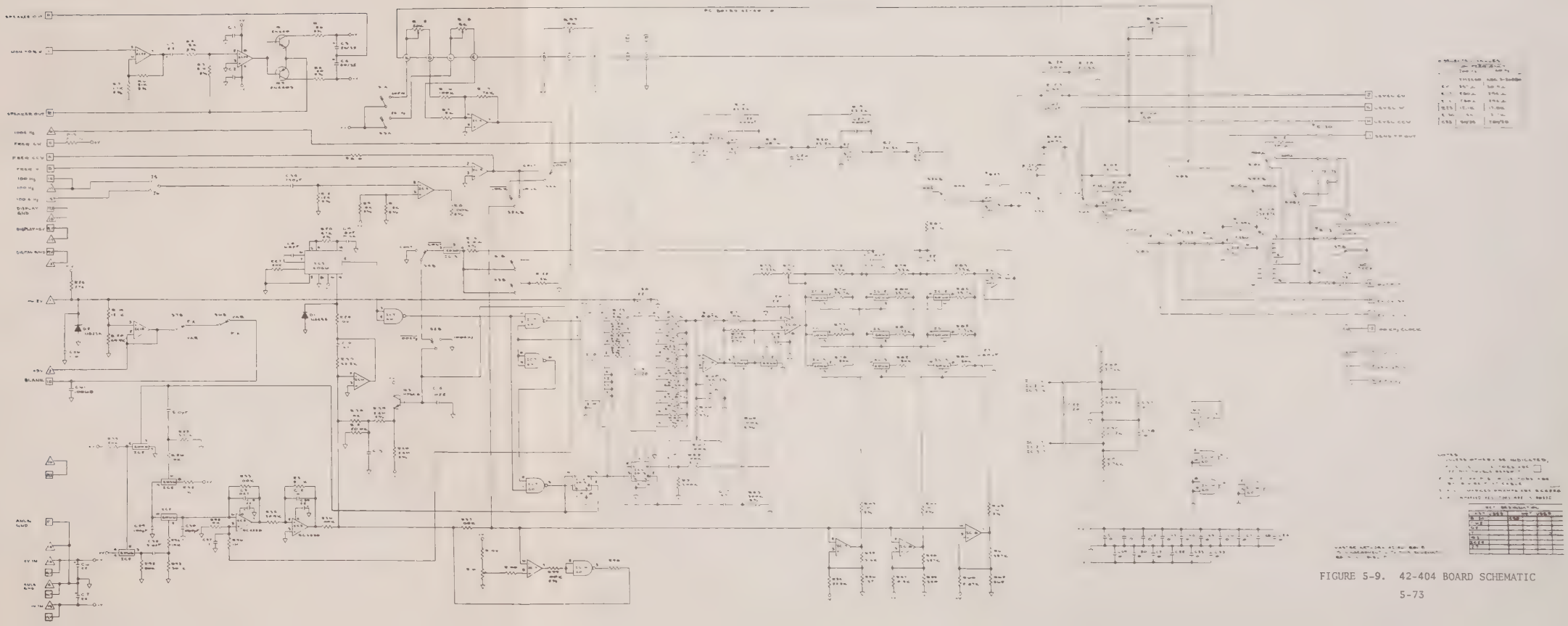

FIGURE 5-9. 42-404 BOARD SCHEMATIC

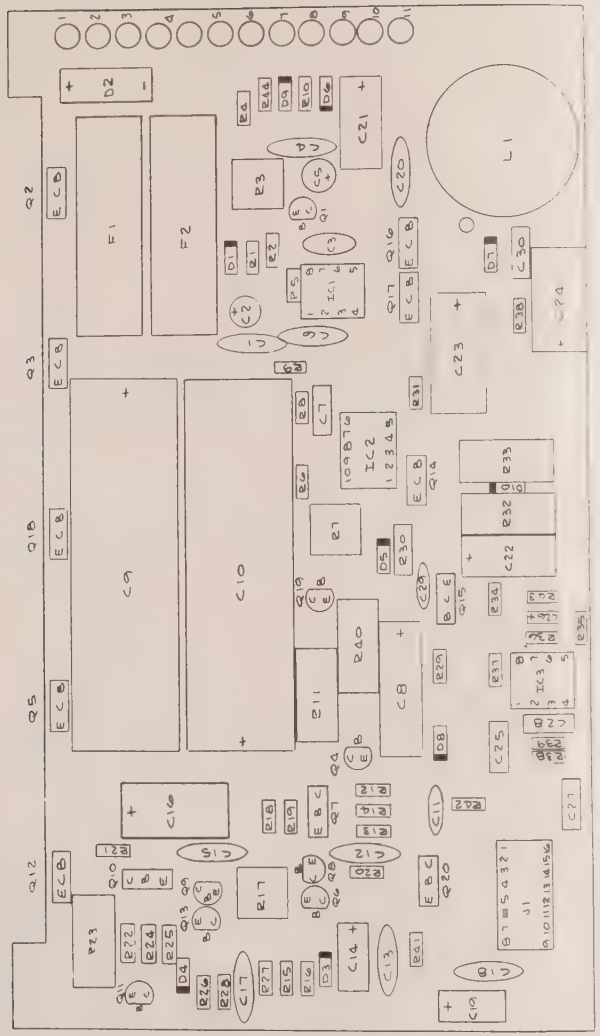

FIGURE 5-10. 42-500 BOARD COMPONENT LAYOUT

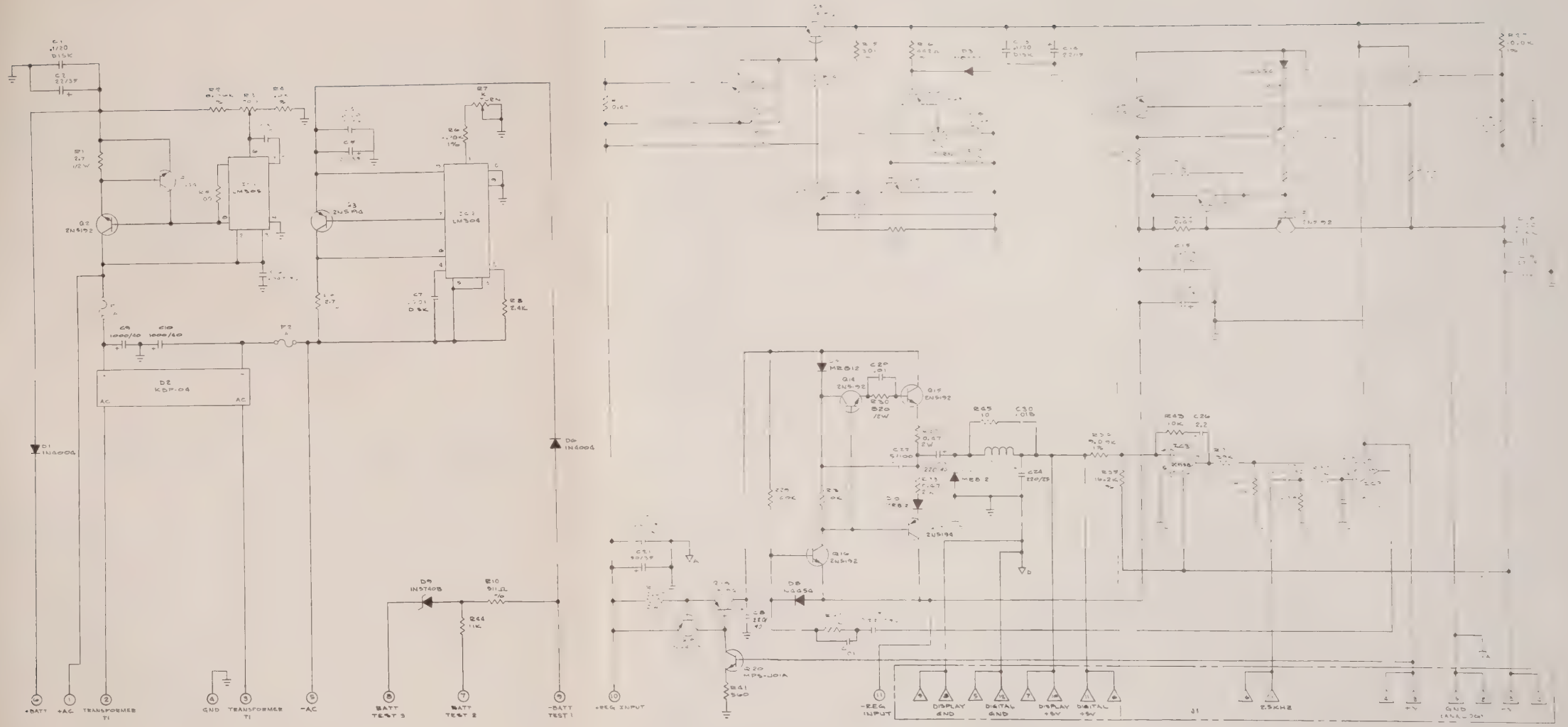

FIGURE 5-11. 42-500 BOARD SCHEMATIC

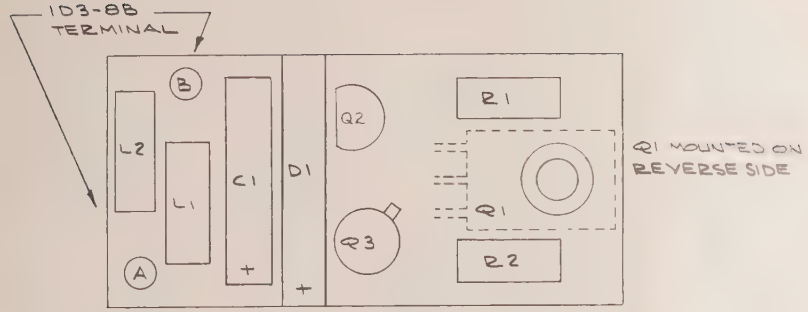

FIGURE 5-12. 42-600 BOARD COMPONENT LAYOUT

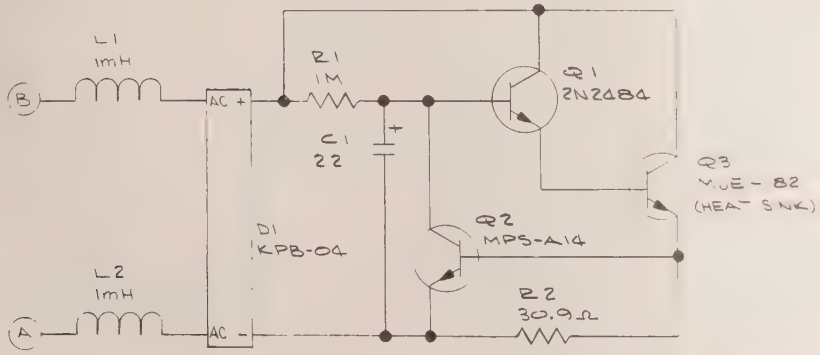

FIGURE 5-13. 42-600 BOARD SCHEMATIC

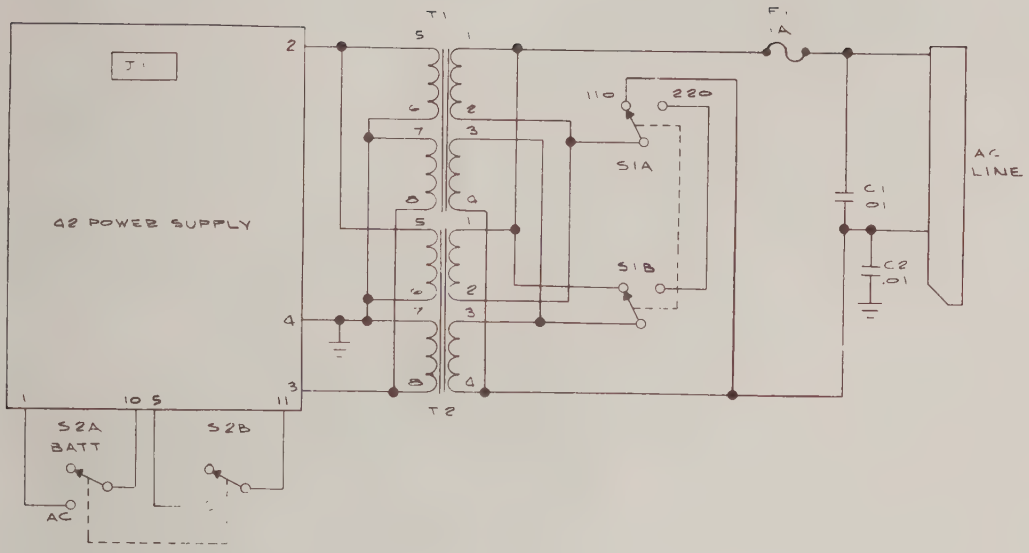

FIGURE 5-14. 42 POWER SUPPLY SCHEMATIC

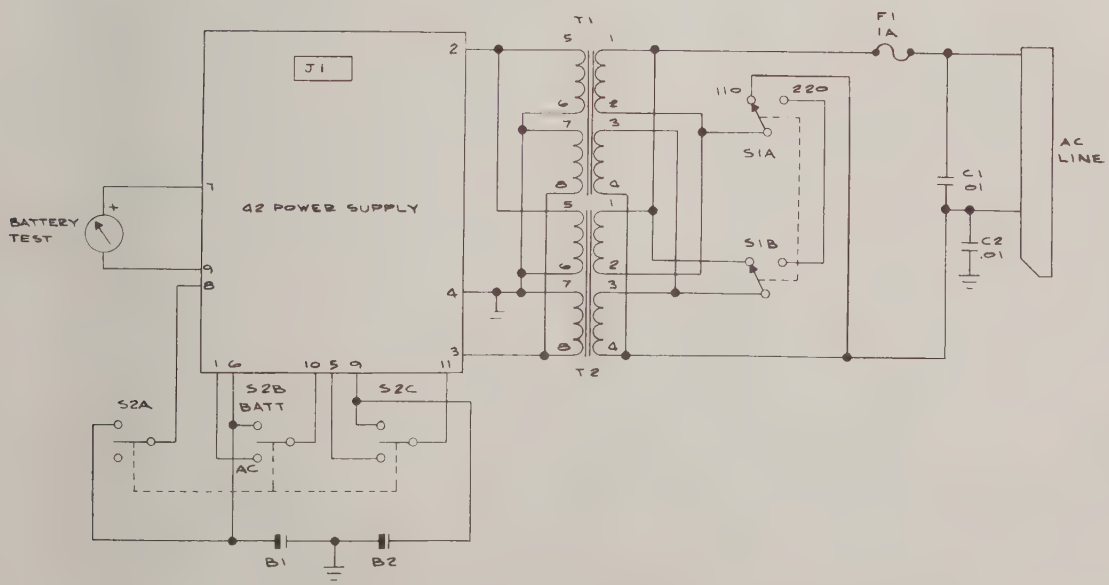

FIGURE 5-15. 42-80 BATTERY SUPPLY INTERCONNECT

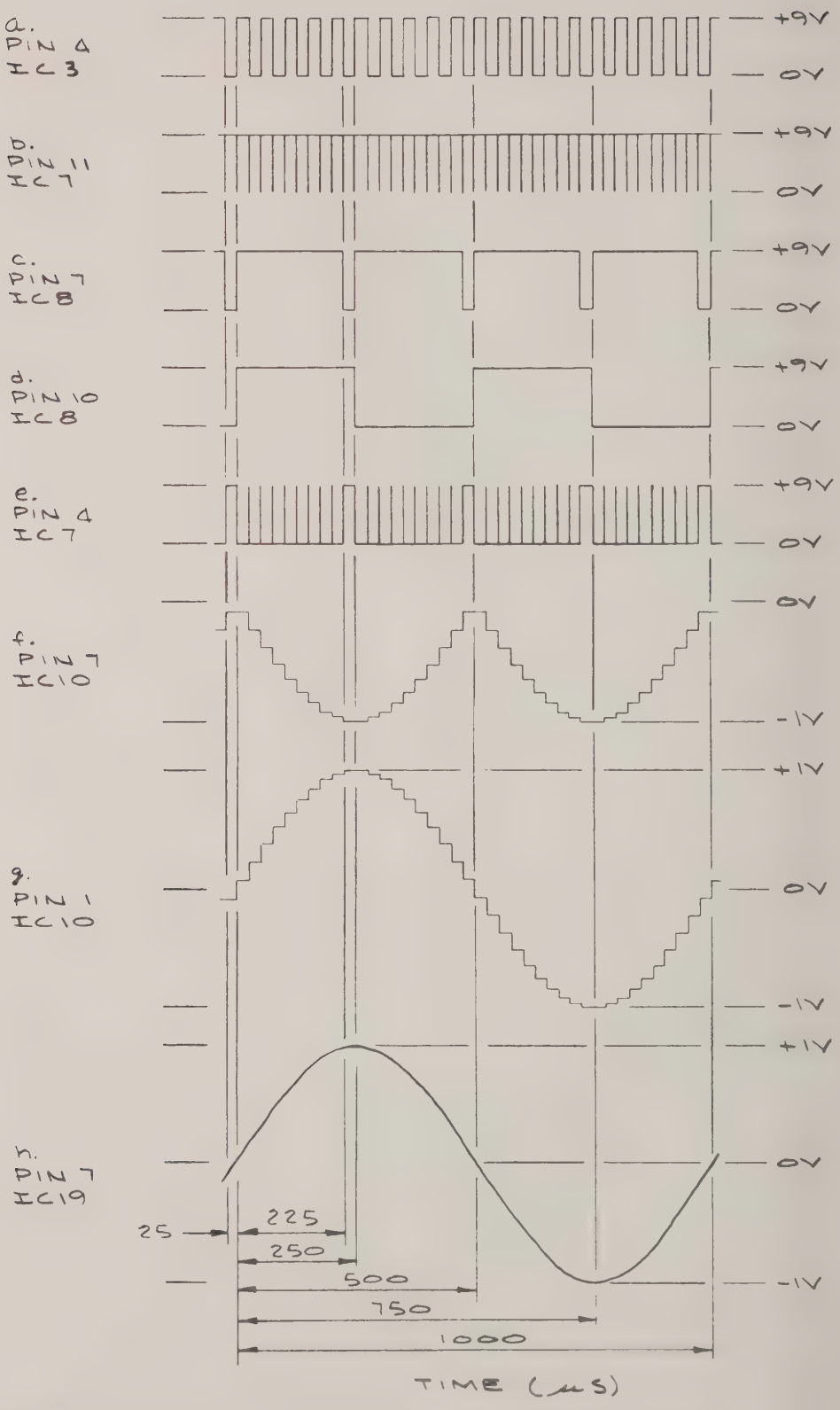

FIGURE 5-16. 42-404 FREQUENCY GENERATOR TIMING DIAGRAM

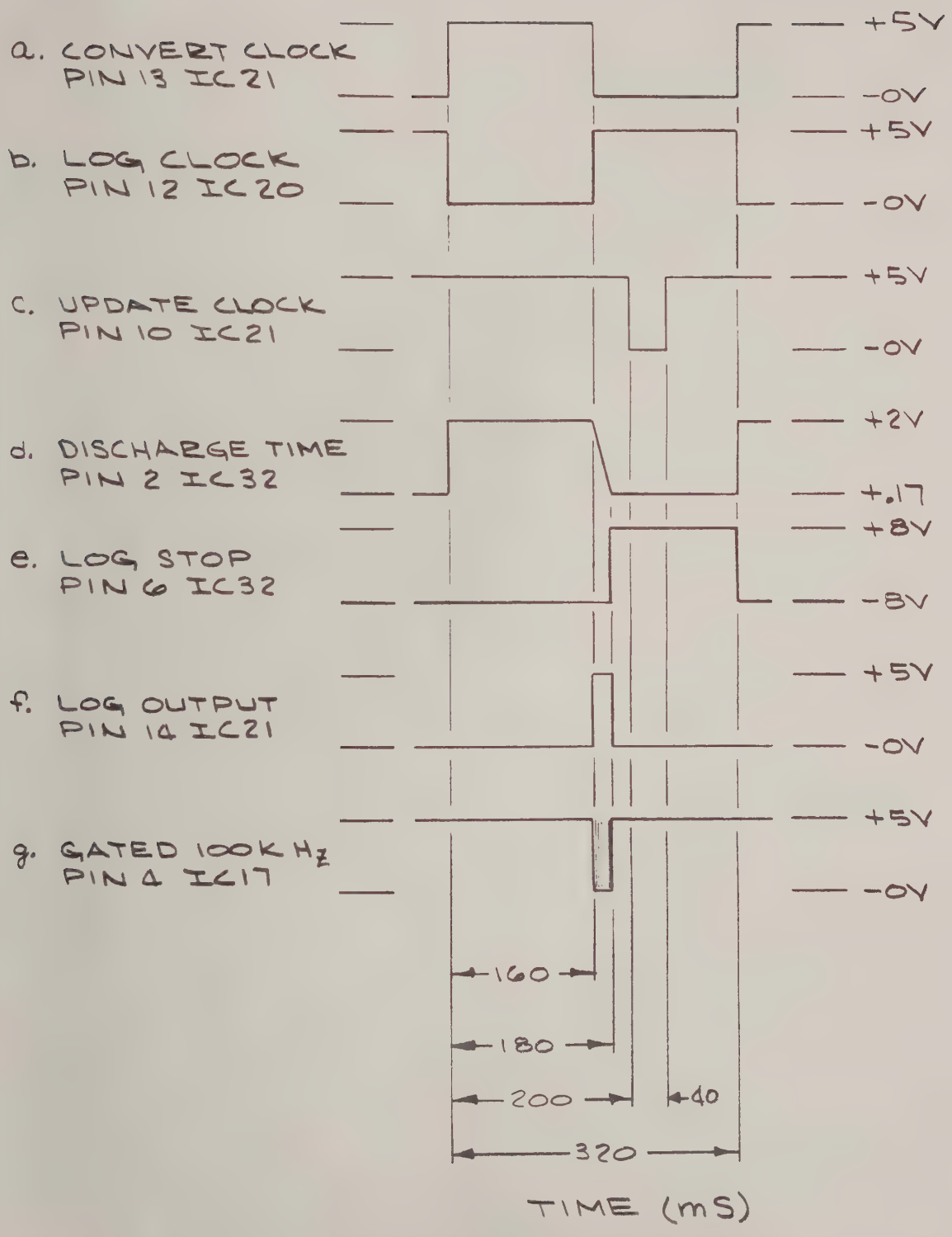

FIGURE 5-17. 42-201 LOG CONVERTER TIMING DIAGRAM

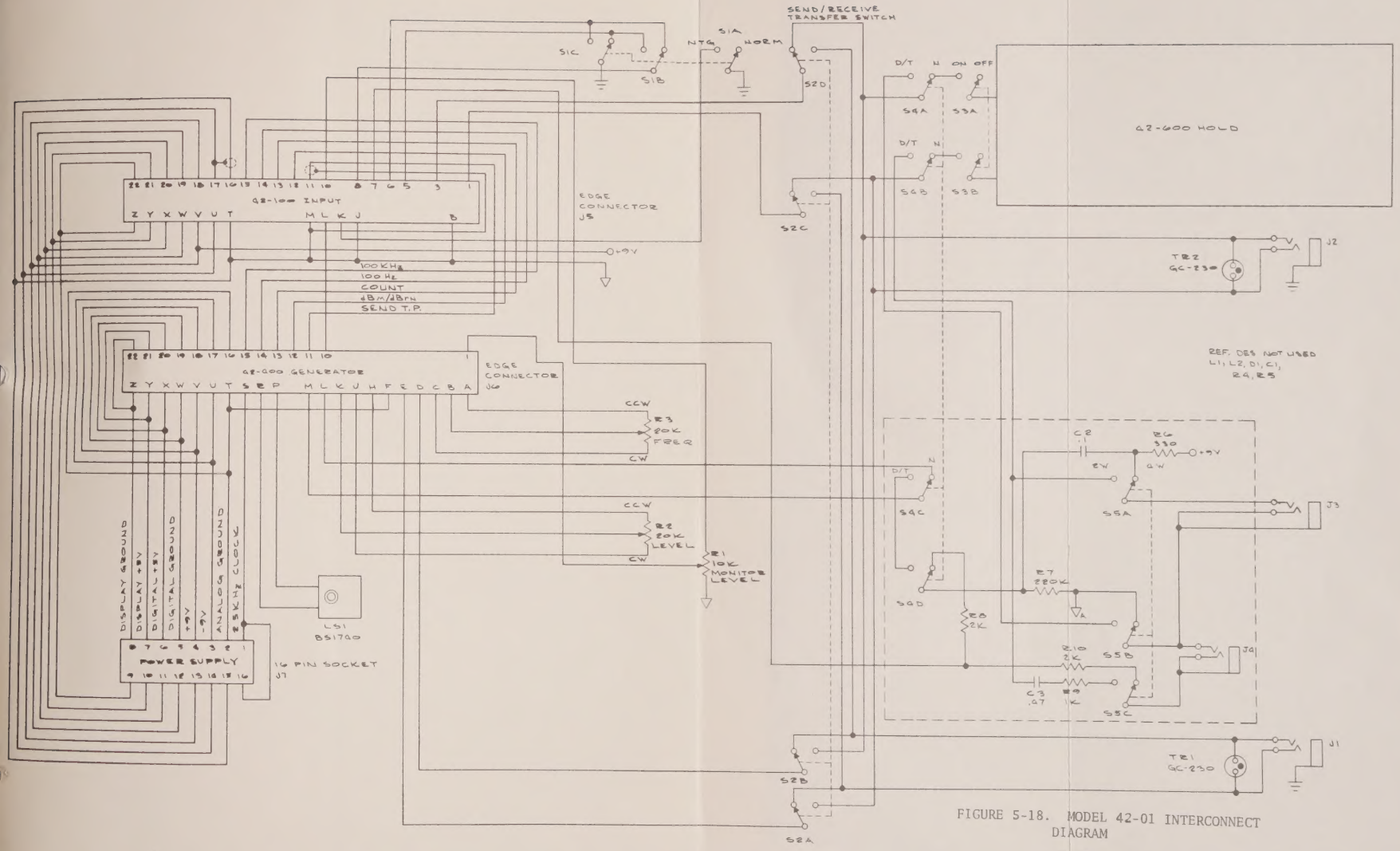

FIGURE 5-18. MODEL 42-01 INTERCONNECT DIAGRAM

NOTES

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